KITCHEN IMPROVISED FERTILIZER EXPLOSIVES

GELATIN EXPLOSIVES

SLURRY EXPLOSIVES

POWDERED EXPLOSIVES

PRILLED EXPLOSIVES

LIQUID EXPLOSIVES

CAST EXPLOSIVES

By:
Tim Lewis

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INFORMATION PUBLISHING CO.
P.O. Box 10042
Odessa, Texas 79767-0042

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FOREWARD

The U.S. standard of living is falling slowly. At the bottom of this fall are countries like Kenya and Pakistan. The youth of America is not interested in bettering themselves and their country, but just in partying and having a good time. What they don't realize is that this advancement of our culture is necessary. Time after time I have heard them say, "But I CAN'T" There is not such thing as can't. Instead what they mean is they won't. Quite a difference in my book. It saddens me greatly to see this. 1 will partly put the blame on our educational system. Of course, the American people should receive the bulk of the blame. This should also be placed on the parents of Americans, as they let themselves and their kids be brainwashed on T.V. I personally know I have never learned anything of real value on T.V. that can't be thought of off hand. Every day we see liberal programming on the "tube" with a one sided slant. I don't believe the people should allow themselves to be brainwashed. With the advent of subliminals and their use on T.V. (yes, they use them today on most commercials contrary to popular belief) proves the desire of a few to control the populace.

Stupid people (brainwashed) or people sheltered from reality as in the U.S.S.R. are the easiest to control. They can do this. Reams of government research on the subject of control of minds have been carried out.

IT'S YOUR RESPONSIBILITY TO KNOW WHAT'S GOING ON, NOT SOMEONE ELSE'S. YOUR MIND IS YOURS TO ENJOY AND USE, NOT FOR SOMEONE ELSE TO GET INSIDE OF AND CONTROL. THIS IS THE WORST TYPE OF THEFT!!

WARNING!!!

The procedures in this book can be dangerous. The compounds produced in these procedures are or can be dangerous. The actual manufacture of explosives is illegal and classified as a felony. These processes are given as information and information only! The actual use of this information by persons not familiar with proper laboratory procedures and. safety can be dangerous if not fatal. Students of explosives should obtain a good college level chemistry book and laboratory procedure handbook. Reasonable care has been used in the compilation of this book and this information has been presented for it's educational value only. **Due to the nature of these explosive compounds, neither the publisher or the author can or will accept any responsibility for this information and it's subsequent use. All responsibility is assumed by the reader!!!!!!**

PRILLED FGAN-#2 FUEL OIL (Diesel)

DETONATION RATE - 2,000-4,400 M/sec ... 6,550-14,410 Ft./sec.

DETONATION PRESSURE - 565,000, 900,000 P.S.I.

DENSITY OF LOADING - .98 to 1.2 G/cc.. Density is controlled by the prills size and bulk density. Users need not worry, as this is already controlled for them.

SENSITIVITY - requires a $^{1}/_{4}$ to $^{1}/_{2}$ stick of dynamite, 50-100 G. high explosive (T.N.T., P.E.T.N., Picric acid, etc.), Detonating cord ("Primercord" or equivalent), 200 G. of other cap sensitive AN explosive (powdered, foamed case, red phosporous-AN, etc.). Shock sensitive to a 30 cm. drop of a 2 Kg. weight.

USE-

BLASTING - It's use is very versatile due to the very pourable nature of the finished product. It must be used in large diameter bore holes (4 inches and larger) that are dry. If wet bore holes are encountered, the charges can be loaded in plastic containers (polyethylene bags or trash bags or equivalent). Good earth mover and finds a great use as a ditching or earth-pond blasting.

DEMOLITIONS - It's use is limited. It can be used to blow foundations, bridge and building substructures with below ground charge placement next to the target.

MUNITIONS - Again it's use is limited as very heavy cases are required with good charge containment. Fragmentation is 30-50% as good at T.N.T.. It will, however, work in this role, but very large charges are required, as the the user must count on the large long duration blast wave to kill by concussion alone as fragment generation is considered poor. As a grenade filler, it will work, but other explosives would be a better choice.

SAFETY PRECAUTIONS - Very stable, but should be made up as needed. AN should be kept dry to ensure proper detonation. This explosive is a definite fire hazard. Flame and heat should be avoided. Not shock sensitive as explosives go, but can be detonated by a very sharp blow (30cm drop of a 2 Kg. weight will detonate). Copper and brass should be avoided in manufacture and all munitions loading and finished products.

Ammonium nitrate fuel oil explosives are without a doubt the most widely used explosive on the face of the earth. It has gained this title by it's low price, ease of on site manufacture and it's good blasting characteristics. Ease of acquisition and relative high power, make this explosive very desirable to home or calindistine manufacture. Being comparable to 40% dynamites, their blasting efficiency can be considered the same for all practical purposes and charge computation figures for 40% dynamite can be used to begin calculations.

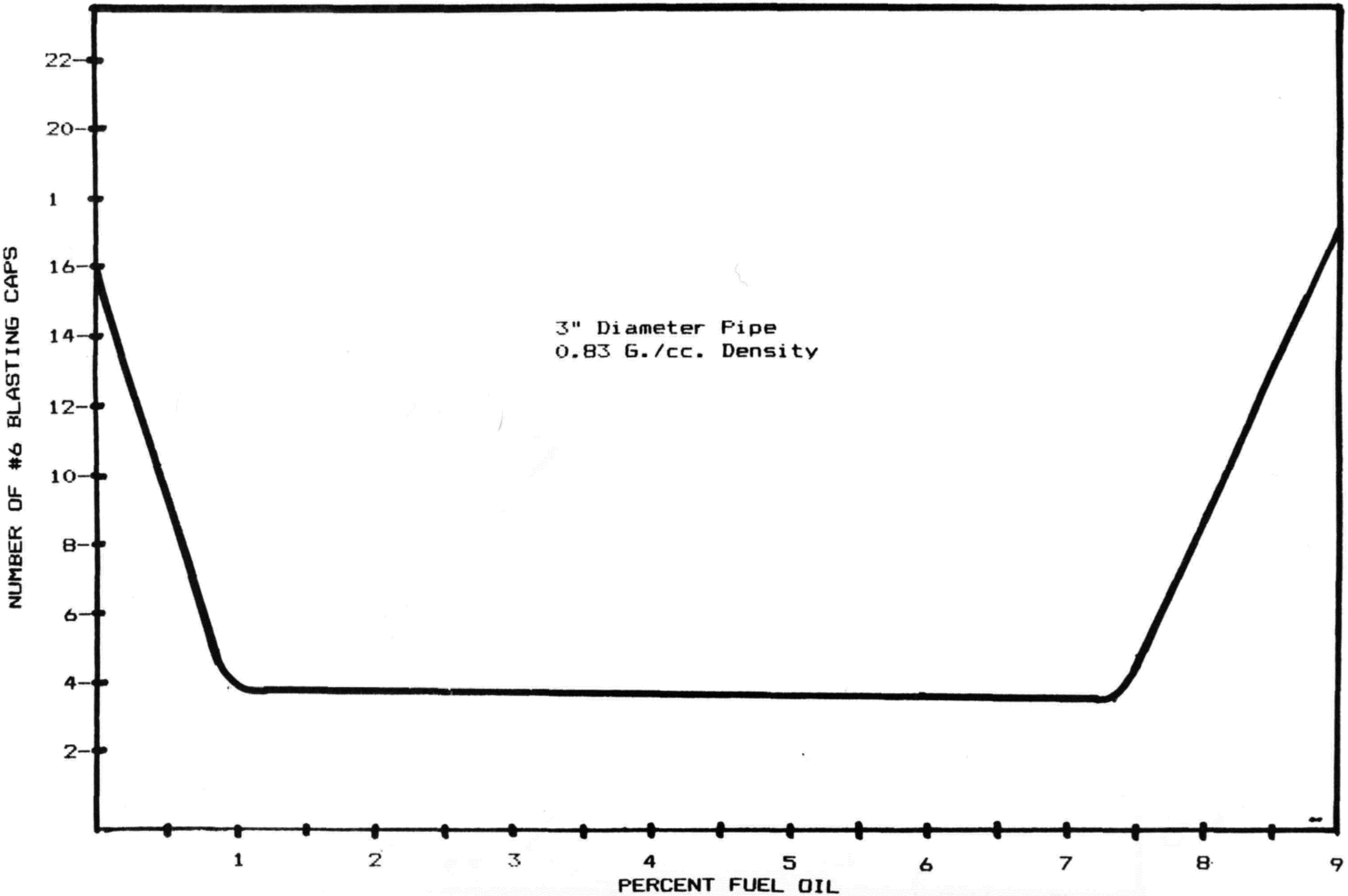
To manufacture these ANFO (prilled) explosives, the procedure is very simple. The AN prills are placed in a container. The proper amount of fuel oil or diesel is added and the mixture is intimately mechanically mixed. For smaller batches of the explosive, an empty, clean and dry coffee can may be used. The mixing in this type of small batch is best done by hand by simply rolling the explosive mixture on the floor after the plastic lid is firmly in place. This should

be done for fifteen to twenty minutes. Larger coffee cans may be used for slightly larger batches. Clean and dry empty five gallon cans could be used to make even larger batches with slightly longer mixing times. With large blasting operations the ideal manufacture technique is to use a cement mixer. A small portable type will work very satisfactorily. With these larger size batches, mixing times should be increased to 1 hour. Another trick to obtaining a good stable standardized explosive is to paint the outside of the cement mixer black. Since operations of this magnitude will always be performed outside and on site, sunlight will heat the mixture and promote the best dispersion of the fuel oil throughout the prilled AN. Of course, all AN explosives should be kept dry and all containers and mixing apparatus should be completely free of moisture and contact with the atmosphere (humidity) should be avoided.

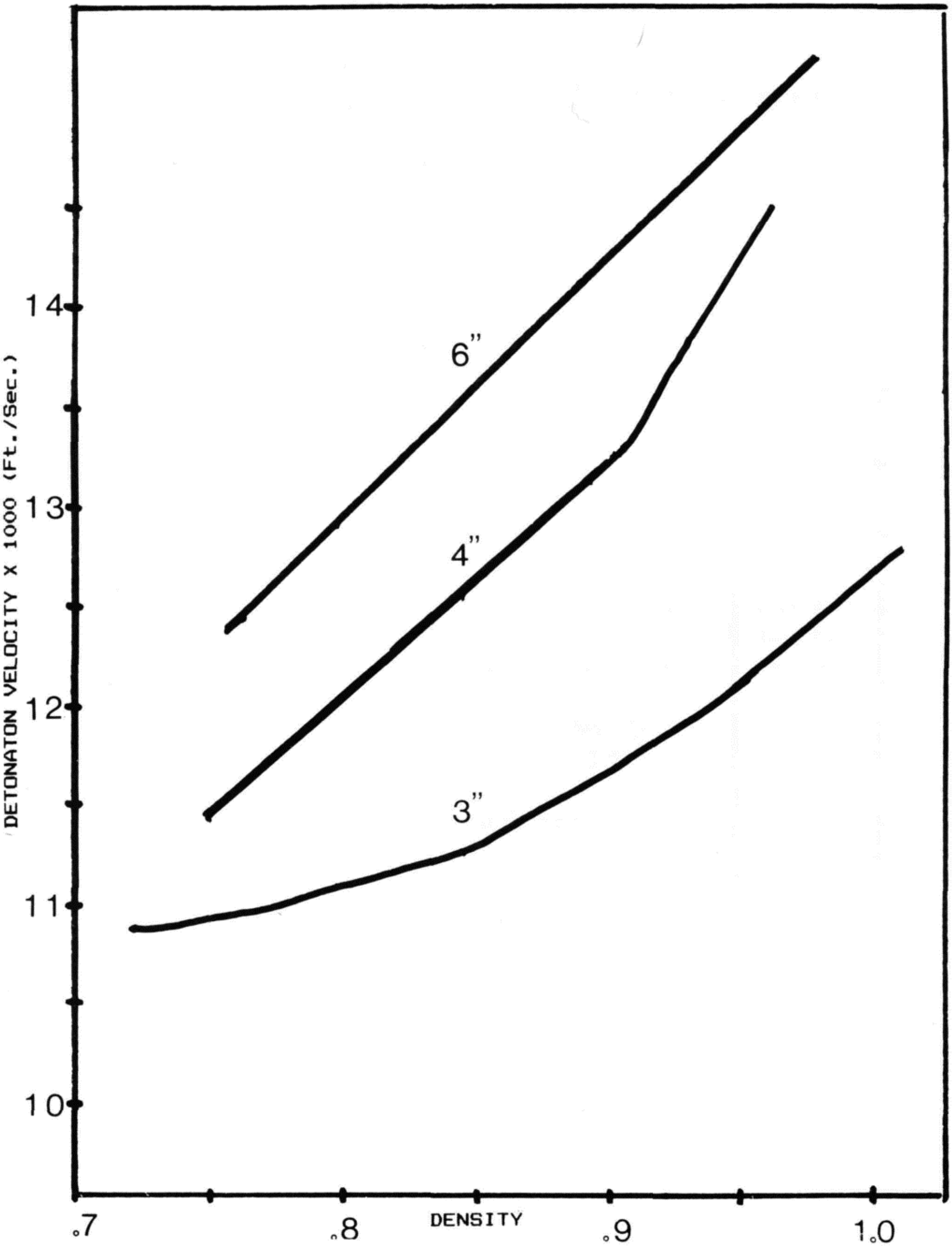
The mixture's proportions can vary somewhat with the desired purpose. Lesser fuel percentages down to 1% total weight will give an explosive that is a little easier to detonate and has the higher detonation rates. Mixtures with a fuel concentration of over 5% will give more power and a greater heaving force and a lower detonation rate, but require heavier boosters. Addition of 1-5% "Bullseye" smokeless powder, give a composition of greater strength and more detonation sensitivity and greater detonation rate than figures at the beginning of this section. Also a .25-1% addition of "Tide" or "Mr. Bubble" soaps, as with other AN explosives, will increase the performance of the finished explosive mixture. The percentages by weight are as follows for ANFO (prilled) explosives:

AMMONIUM NITRATE (fert. grade) 94.5%
FUEL OIL or DIESEL 5.5%

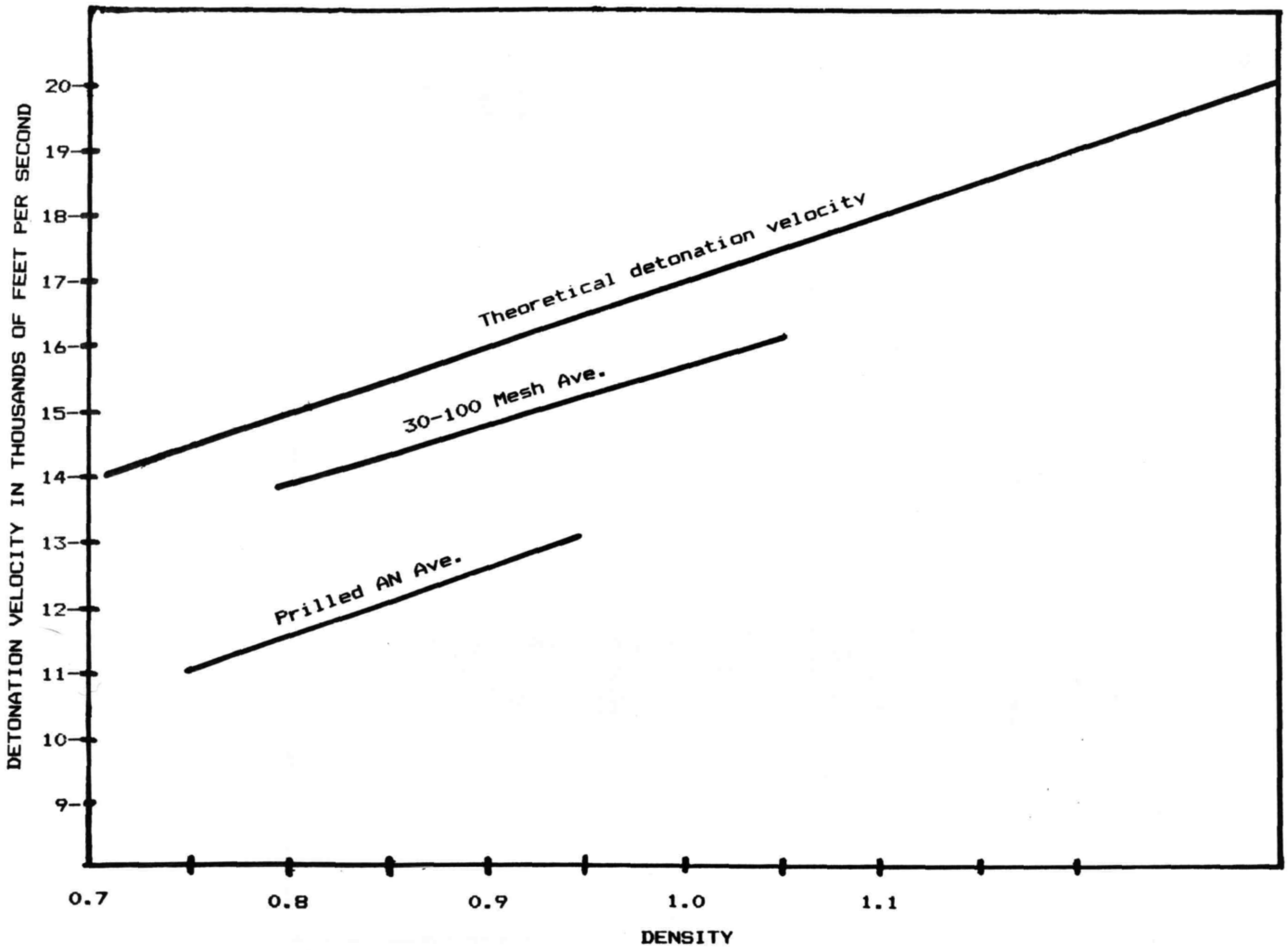
This explosive is the best and safest of the blasting explosives! For all general blasting work, dollar for dollar, it is the best explosive for 85% of all blasting operations.



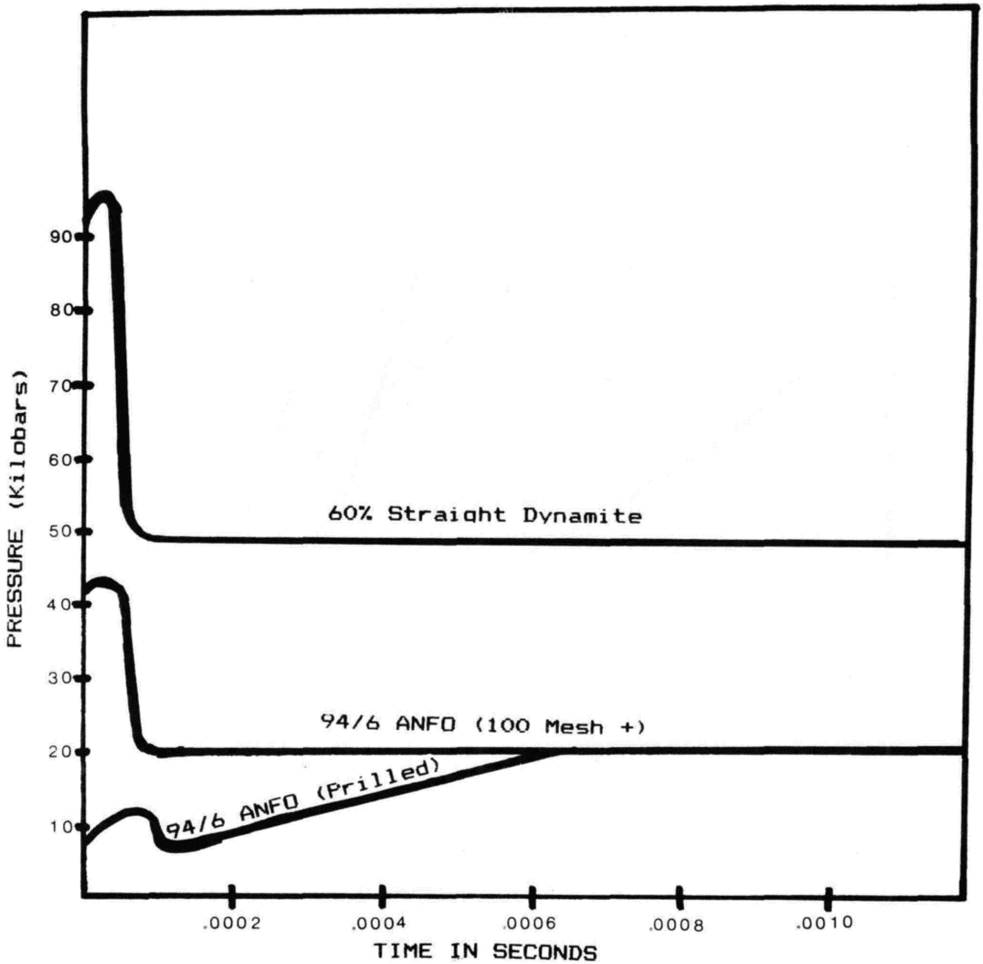
NUMBER OF #6 BLASTING CAPS
22
20
1
16
14
12
10
8
6
4
2
3" Diameter Pipe
0.83 G./cc. Density
1
2
3
4
5
6
7
8
9
PERCENT FUEL OIL



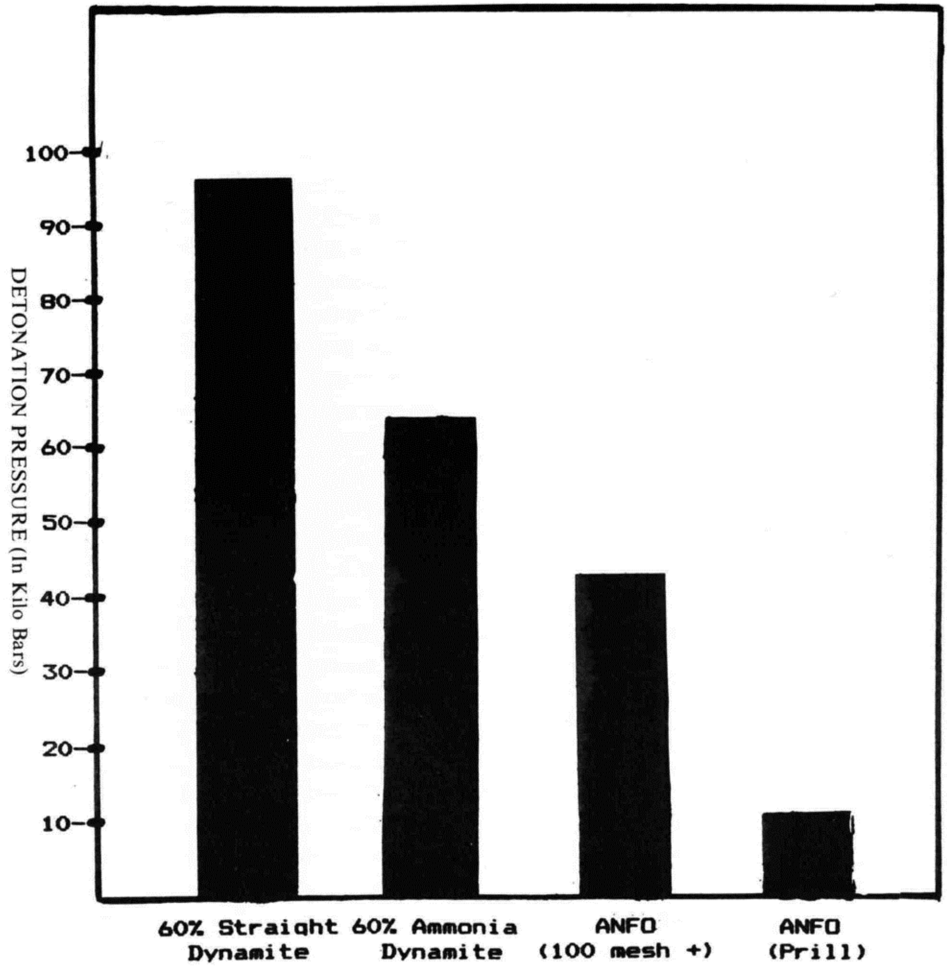
DETONATON VELOCITY X 1000 (Ft./Sec.)
14
13
12
11
10
6"
4"
3"
.7
.8
.9
1.0
DENSITY



DETONATION VELOCITY IN THOUSANDS OF FEET PER SECOND
20
19
18
17
16
15
14
13
12
11
10
9
Theoretical detonation velocity
30-100 Mesh Ave.
Prilled AN Ave.
0.7
0.8
0.9
1.0
1.1
DENSITY



PRESSURE (Kilobars)
90
80
70
60
50
40
30
20
10
60% Straight Dynamite
94/6 ANFO (100 Mesh +)
94/6 ANFO (Prilled)
.0002
.0004
.0006
.0008
.0010
TIME IN SECONDS


DETONATION PRESSURE (In Kilo Bars)
100
90
80
70
60
50
40
30
20
10
60% Straight Dynamite
60% Ammonia Dynamite
ANFO (100 mesh +)
ANFO (Prill)

PRILLED AN-FUEL OIL (Cap sensitive)

DETONATION VELOCITY
Confined - 4600 M/sec.
Unconfined = 3200-4600 M/sec.
DETONATION PRESSURE - 490,000-1,000,000 P.S.I.

SENSITIVITY - One #8 blasting cap will initiate detonation in charges larger than 2.25 inches, but similar untreated prills will not detonate.

USE-
BLASTING - Useful in blasting due to the fact that it is easy and very inexpensive to prepare. This prilled form of the usual ANFO explosives is attractive to the blaster because in nearly all applications this type of prilled ANFO explosive will have a higher detonation rate and therefore an increased performance over it's counterpart.
DEMOLITION - See PRILLED AN-FUEL OIL
MUNITIONS - See PRILLED AN-FUEL OIL

This is a very interesting development of the ANFO explosives. While being very simple, it effectively sensitizes the fertilizer grade of AN when mixed with diesel, so that one blasting cap will detonate the resulting mix. It makes use of the tendancy of even small amounts of water to effect the crystalline structure of the prills in such a way that effective density is lowered. This, in conjunction with available fuel, yields an explosive that is cap sensitive. This is one of the most simple cap sensitive explosive compositions in this book.

This procedure really should be performed of all prilled AN explosives. This lowers the actual density of the prills. Giving an optimum density for the proper absorbtion of most ANFO. Compositions with 94.4% AN and 5.6% fuel oil are considered optimum. These will also be cap sensitive. The fuels in the compositions below are considered slightly higher than the AN FO explosive due to sensitivity and performance respectively. Take 40 G. of ammonium nitrate prills (fertilizer grade) and to them add 10 G. (lOcc) water. This mixture is heated to 90 degrees C. (195 degrees F.). All of the prills should dissolve. If not stir the liquid until they do. This liquid (saturated AN-water solution) is then added to a mixture of 14 G. #2 diesel and 186 G. ammonium nitrate prills (fert. grade). This mixture is stirred and poured into a suitable container (stainless steel pan) and placed in an oven with the thermostat set at 150 degrees F. for 2.5 hours with constant supervision. Ammonium nitrate when mixed with fuels are dangerous when heated. Better and safer than this is to place these wetted prills in a desicator (laboratory drier) or in a container with a vacuum drawn on it and it's contents so as to remove the water. This vacuum method of water removal is best and will yield the highest performance mixtures. In boiling water off the AN prills under reduced pressure porous prills are produced by the water vapor escape from inside the prills.

These prills will produce cap sensitive mixtures easily with almost any liquid hydrocarbon. Fuel oil, naptha, gasoline, carbondfdisulfide and almost anything liquid that will combust will work.

AMMONIUM NITRATE (Fert, prills) .... 40 G. or 14.6%
WATER .... 10.cc or 4.0%

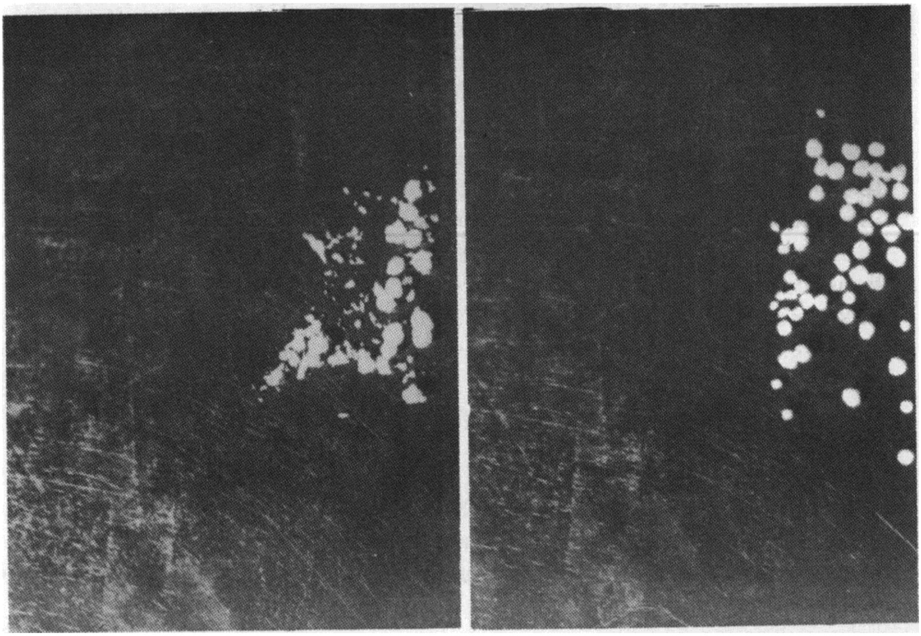
AMMONIUM NITRATE (Fert, prills) .... 186 G. or 74.4%

GASOLINE .... 5 G. or 2.5%
WAX (PARIFFIN) .... 9 G. or 3.1%

or

DIESEL .... 7 G.
ALUMINUM POWDER (400 Mesh) .... 14 G.

This procedure should work on other liquid fuels except the very volatile ones such as gasoline and the alcohols giving easily prepared cap sensitive explosive compositions. Also the substitution of 14 G. of powdered aluminum for 7 G. of the diesel will give a slightly higher performance explosive.



Untreated prills. **Treated prills.**

PRILLED AN-POWDERED COAL OR CHARCOAL

DETONATION VELOCITY - 2400-3500 M/sec.
DETONATION PRESSURE - 390,000-800,000 P.S.I.

USE-

BLASTING - Limited to earth moving and other blasting operations where high "heaving" value and not high velocity are the factors influencing explosive choice. A very cheap easily manufactured blasting agent with a cost effectiveness not easily surpassed in most bulk blasting operations.

DEMOLITIONS - Not a good choice due to the very low detonation rate and relative bristance.

MUNITIONS - Not a good choice here either due to the low velocity and low bristance or shattering power.

A good cheap blasting agent. This explosive should be limited to earth moving applications and with a preference for the prilled AN-fuel oil explosive over this explosive. In all, with easy acquisition of the sensitizer, this composition is one of the better home concocted explosives for a blasting application. Coal or charcoal is readily available and cheap. This explosive is manufactured by the addition of the powdered charcoal to the prills and subsequent tumbling or shaking to ensure an intimate mixing of the components. A major drawback of this mixture is the tendancy for the charcoal and the AN to separate out due to the different actual densities of the two ingredients. A small percentage (1-2%) of fuel oil substituted for part of the charcoal, causes the charcoal to adhere to the prills and virtually eliminate this problem. Actual composition of these explosives are given below:

#1

PRILLED AN	94%
CHARCOAL (powdered dust)	6%

#2

PRILLED AN	94%
CHARCOAL (powdered dust)	5%
#2 FUEL OIL OR DIESEL	1%

Minimum charge diameter of the first formula should be around 8 inches. Whereas the 2nd formulation can be used in bore holes 6 inches or greater in diameter. Water and wet blasting condition should be avoided with the first composition due to the lack of water tolerance. The 2nd explosive has a slightly greater tolerance, but with all AN explosives, unless they are designed for wet applications, water and wet conditions should be avoided.

PRILLED AN-GASOLINE

DETONATION RATE - 2700-4650 M/sec.
DETONATION PRESSURE - 190,000-1,100,000 P.S.I.

SENSITIVITY - Same as prilled An-Fuel oil. Perhaps slightly more sensitive, but adequate boosters are required to ensure an efficient detonation.

USE-
BLASTING - Not suitable due to the volatility of the fuel sensitizer. Could be used if the volatile nature were taken into account and steps taken to counter act this fuel sensitizer loss due to evaporation. A powerful higher velocity explosive as opposed to AN-fuel oil explosives. Also cost effective due to the ready access and low cost of the sensitizer.

DEMOLITIONS - Not suitable due to the volatile nature and relative low velocity of detonation. For more about usage, see prilled An-fuel oil explosive. Volatility could be overcome to some extent if necessary by on site mixing and immediate use!!

MUNITIONS - Unsuitable!!

This explosive is limited in use due to it's volatile nature. The gasoline will evaporate with time, giving erratic performance and detonation sensitivity. It is easier, however, to make than the prilled AN-fuel oil composition. The lower density of the fuel makes for better penetration of the AN prills and also gives an explosive of higher detonation velocity and consequently slightly higher actual power. It is easily prepared by simply pouring the gasoline over the AN prills in a container impervious to gasoline and tumbling until a homogeneous mixture is obtained. As with the other prilled AN explosives, higher performance can be obtained by the addition of .5 to 1% total explosive weight of sodium dodecyl benzene sulfonate ("Tide", "Mr. Bubble" soaps or Connaco 50 detergent). The explosive consists of the following mixture:

PRILLED AN	94%
GASOLINE	6%

This explosives volatile nature can be overcome to some extent by enclosing the mixed explosive composition in something impervious to gasoline. Large trash bags would serve this purpose. The explosive would need to be used quickly, however, as this measure would not be enough to ensure the explosives loss of sensitizer to evaporation. Better explosive composition can be had, but this one would work and is powerful!!

PRILLED FGAN-ANTIFREEZE

DETONATION RATE - 2700-4500 M/sec.
SENSITIVITY - See FGAN-Fuel oil.

USE-
BLASTING - Use is limited due to the high cost of the diethylene glycol (antifreeze). It is also very hygroscopic. Good power and slightly greater detonation rate than the FGAN-Fuel oil composition. Good for earth moving and other similar uses. Cost effectiveness less than that of FGAN-Fuel oil.
DEMOLITIONS - See Prilled FGAN-Fuel oil.
MUNITIONS - Hygroscopic. See Prilled FGAN-Fuel oil.

A good explosive if the ethylene glycol or antifreeze is all the manufacturer has available. It is slightly easier to detonate than the FGAN-Fuel oil composition and has a greater detonation rate, all things being equal. Boosters would not need to be quite as large as the FGAN-Fuel oil mixture would require. It is also very hygroscopic and steps should be taken to ensure that the contamination of the mixture with unwanted moisture is avoided.

This explosive is manufactured in essentially the same way as all the other explosive compositions in this book so far. For details of these manufacture techniques, see Prilled FGAN-Fuel Oil. The composition is as follows:

PRILLED FGAN 95.0%
DIETHYLENE GLYCOL (Antifreeze) 5.0%

This glycol-AN explosive like the methanol and ethanol compositions are very efficient. Since the glycols and glycerins are in effect forms of alcohols, they perform similarly. Glycerin could be substituted for the glycol, but it's cost is even higher than glycol. Addition of a small amount of "Tide" or "Mr. Bubble" (e.g. sodium dodecyl benzene sulfonate) will increase the performance and detonation rate by 15-35%.

PRILLED FGAN-MAGNESIUM

DETONATION RATE - 2600-4200 M/sec. 8536-13,790 Ft./sec.
DETONATION PRESSURE - 400,000-1,000,000 P.S.I.
SENSITIVITY - See Prilled FGAN-Aluminum.

USE-

BLASTING - See Prilled FGAN-Aluminum
DEMOLITIONS - See Prilled FGAN-Aluminum
MUNITIONS - See Prilled FGAN-Aluminum

This explosive composition is nearly identical to the Prilled FGAN-Aluminum explosive. It is, however, a slightly more bristant, more powerful explosive. This is due to the higher temperature of the combustion of the magnesium powder as opposed to the aluminum powder. As with the FGAN-Aluminum composition, this explosive gives an abnormal gas volume on detonation. This will give this explosive a greater blast effect than most of the explosives in the ammonium nitrate family. As with all good aluminum containing explosives, they are oxygen deficient. This allows an after burning effect. By this I mean the unreacted or oxidized fuel (Magnesium), preheated to combustion temperature, is allowed to finish its combustion with the atmospheric oxygen. This gives these explosives a high blast rate due to the long pulse of positive pressure generated by the detonation. Aluminum is really preferable to magnesium, due to its much lower cost. It will, however, on detonation at night give a much brighter flash than will the aluminum. This is, of course, due to the greater temperature of detonation, which causes a more luminous candescence of the gases in the fireball. This boils down to a very bright flash upon detonation in low light conditions. It should cause temporary night blindness too!! Its composition is as follows:

PRILLED FGAN	80%
MAGNESIUM POWDER (300+mesh)	20%

PRILLED AN-NITROGLYCERIN

DETONATION RATE - 2800-4800 M/sec.

DETONATION PRESSURE - 450,000-1,000,000 P.S.I.

Depending on % of nitroglycerin

SENSITIVITY - This factor depends on the % of nitroglycerin. A 4% composition requires a $^{1}/_{4}$ stick of dynamite or equivalent. An 8-15% composition requiring only a #6 blasting cap.

USE-

BLASTING - A good explosive for this purpose with a high bristance and detonation rate. Very sensitive to the impulse from a reasonably small #6 detonator. However, this explosive due to the nature of the explosive sensitizer would be limited to someone with prior chemistry experience. There is danger in manufacture of this explosive!! While millions of gallons of nitroglycerin have been manufactured since its introduction into the explosive field, home manufacture by the unknowing, stupid, careless and suicidal WILL RESULT MOST LIKELY IN DEATH!! This explosives manufacture should never be undertaken unless the procedure is completely understood. THERE IS NO ROOM FOR ERROR OR CARELESSNESS!!!! This explosive will, with contact to the skin, cause the most tremendous migrain headache. Repeated and continuous exposure to the skin and subsequent absorbtion will cause "nitro heart" and possible future coronary problems and risks. Also contact with detonation residues and gases will cause these same headaches and risks. The powdered form of this explosive is a better choice as larger amounts of "nitro" can be absorbed safely. For charge computation use 50% ammonia dynamite. DEMOLITIONS - This explosive could be good for cratering charges, but is not as cost effective as ANFO explosives. The powdered form of this explosive would be a better choice, as it is more easily packaged and will hold a higher percentage of "nitro".

MUNITION - The only munition this explosive would even be remotely good for, would be some type of homemade fragmentation grenade.

First usage of this type explosive was made by the famous father of modern explosives, Alfred Nobel. He purchased the patent from C.J. Ohlsson and J.H. Norrbin in the early 1870's. This should give you some idea of how long these explosives have been in use. They are powerful, primarily blasting explosives. They have been supplemented in the modern explosives industry due to the cost advantage of AN fuel oil explosives. These, however, are more powerful, due to the higher heat of explosion which is a side effect of the "nitro" compounds addition to the prilled ammonium nitrate. The "nitro" makes the explosive resistant to water, which in some applications is advantageous. As the nitroglycerin is added to the AN prills it forms a gel of AN and nitroglycerin on the surface of the prill. This serves in the carrying of the shock wave generated by the detonator throughout the explosive charge. This of course gives the ammonium nitrate a higher detonation rate with only the addition of a small amount of the high explosive sensitizer.

NITROGLYCERIN MANUFACTURE - The manufacture of nitroglycerin is really a simple affair. The tendancy of nitroglycerin to explode from a shock (a slight jar), heat (overheating of the acids during manufacture) and decompose (explosively) from impurities make the manufacture a testing one. It can be done with a good deal of safety by eliminating as many of the above problems in manufacture. Only reagent or U.S.P. grade chemicals should be used. This will eliminate the possibility of explosive decomposition from impurities. The explosive oils sensitivity to shock can be reduced by careful control of the temperature and avoiding bumps and jars of the containers during the "nitration" process. The process below will not give as good a yield as the process in "KITCHEN IMPROVISED PLASTIC EXPLOSIVES". It is, however, in my opinion, a simple relatively safe process for the person not inept in chemistry and laboratory processes.

CAUTION: Eye protection and viton gloves and apron should be worn during this lab type process. Hash facilities (a shower) should be quickly accessable. This process should be done in a well ventilated area!!

Take 100 ml. (CC) of nitric acid (specific Gravity 1.42, 70%, obtained from a chemical lab. supply house) and place in a 1 pint fruit canning jar. 150 m. (CC) of sulfuric acid (specific gravity 1.8, 98% / obtained from janitorial supply) is then slowly poured into the nitric acid. This acid mixture will become hot when this addition takes place. This container should be placed in a bath of salted ice water. Care should be taken to ensure that none of the water gets into the acid mixture. That would cause spattering of the hot acid mixture and big problems for the person with the acid shower. A thermometer is placed into the mixed acids. The temperature of the mixed acid should be allowed to drop to 0 degrees C. (32 degrees F.). While the acids cool, place 80 ml. (CC) anhydrous glycerin in a measuring cup. This cup should be placed in the freezing compartment of a refrigerator or cooled in someway taking care to ensure water is not absorbed by the glycerin. A quart canning jar is then filled to $^1/_2$ its volume of crushed ice and clear clean cold water. When the acids are at 0 degrees and the glycerin is as thick as cold molasses or "Karo" syrup, the glycerin is slowly poured in to the acid mixture in a manner that it floats on top of the cold mixed acids. *CAUTION: If at any time red fumes begin to issue from the acid-glycerin combination, pour immediately with a gloved hand into the water and cracked ice previously prepared!!!!!!!*

With a teflon stirrer carefully stir the mixed acid and glycerin combination TAKING GREAT CARE NOT TO CONTACT THE SIDES OR BOTTOM OF THE CONTAINER!!! This stirring should be done vigorously and carefully for 15 seconds and the whole mixture then immediately poured in to the cracked ice. The nitroglycerin will fall out as a whitish oil in the bottom of the container. Care should be taken to avoid bumping the lip of the jar with anything and the container kept completely free of shocks and bumps. The acid-water is then poured off the nitroglycerin oil in the bottom of the container. Cold water is then added to the "nitro" in the bottom of the quart canning jar. The liquids are carefully swirled and as much water poured off as possible. This washing is carried out one more time with the excess water being poured off. The resulting

oil and small amount of water is then treated with small amounts of sodium bicarbonate (baking soda). The soda at first will effervesce (fizz). These additions should be made until the effervescent reaction ceases with new small additions of soda. The remaining water can then be removed with a syringe carefully. Care should be taken not to bump the bottom of the container with the syringe. The nitroglycerin should now be incorporated into the explosive. ADDITION OF 25% ACETONE TO THIS EXPLOSIVE OIL WILL RENDER IT MUCH LESS SENSITIVE TO SHOCK AND IS ADVISED!!! To manufacture this explosive simply add the nitroglycerin to the AN prills with gentle kneading with gloved hands (dishwasher gloves will work, but should be discarded afterwards). The charcoal or other ingredient is added to the AN before this nitro addition if desired. This addition will give a more powerful explosive and is very desirable. If explosive is to be used immediately, the addition of the fuel will not be necessary as the acetone will serve this purpose. Below several compositions are given:

#1

PRILLED AN	88%
ONE OF THE FOLLOWING: CHARCOAL, DIESEL OIL ANTIFREEZE, SULFUR, MOTOR OIL	7%
NITROGLYCERIN	5%

#2

PRILLED AN	83%
ALUMINUM OR MAGNESIUM POWDER (400 MESH)	10%
NITROGLYCERIN	7%

#3

PRILLED AN	79%
FUEL (ONE FROM COMPOSITION #1)	6%
NITROGLYCERIN	15%

#4

PRILLED AN	72%
ALUMINUM OR MAGNESIUM POWDER (400 MESH)	13%
NITROGLYCERIN	15%

These explosives should be safe and very powerful for the compositions containing higher percentages of nitroglycerin. The last two explosive formulas will be the most easily detonated by a blasting cap. The last two will not need confinement to achieve a good explosion, but the first formulations are primarily for blasting purposes. The compositions containing aluminum should have nitroglycerin additive containing as little water as possible which will give a better performance and longer storage life.

PRILLED FGAN-METHANOL OR ETHANOL

DETONATION RATE - 2800-4500 M/sec. 9193-14775 Ft./sec.
SENSITIVITY - Same as prilled FGAN-#2 fuel oil.

USE-

BLASTING - Practically the same as prilled FGAN-#2 fuel oil. This explosive is less water tolerant as the FGAN-FO mixture. It also has a slightly higher detonation rate for all practical purposes. But has a higher cost due to the increased cost of the sensitizer.

DEMOLITIONS - See Prilled FGAN-Fuel Oil.

MUNITIONS - Not desirable due to the very volatile nature of the sensitizer. For performance see Prilled FGAN-Fuel oil.

This explosive is a good explosive, but the tendancy of the sensitizer to evaporate before the charge is ready for detonation is a major problem. This can be over come by sealing the prepared charges in an impervious container to avoid this evaporation. It also has a characteristic of being very hygroscopic, which is the tendancy to take water from the air which makes detonation more difficult. It is, however, a good powerful explosive composition. Its higher detonation rate over the AN-fuel oil composition is a definite plus. The figures above do not really reflect this however. This greater detonation rate is realized in charges that are not so well confined. An explanation of this is the less viscous (thick) shorter simpler molecule is more easily transformed under the impulse of the detonation wave as it moves through the explosive triggering the rapid transformation from solid to gaseous state.

This explosive is more quickly manufactured due to the less dense fuel sensitizer. This gives a more rapid and uniform absorbtion into the fertilizer prills. The manufacture is accomplished by placing the proper amount of AN prills in a container. Addition of the proper ratio of alcohol is the next step. These are stirred or tumbled together until a complete uniform mixture is obtained. The percentages are as follows:

PRILLED FGAN	94%
METHANOL or ETHANOL ALCOHOL	6%

This explosive is, as we stated earlier, sensitive of moisture and this should be avoided in any storage or usage. One advantage of this explosive is the fact that it produces very modest amounts of harmful gaseous detonation products, this explosive would be the explosive of choice if usage in a semi-confined area where work would need to commence right after the shot is fired! It is not permissable in a coal mine due to the heat and longer period of high detonation product heat. This can be overcome by the following composition:

PRILLED FGAN	82.5%
METHANOL or ETHANOL ALCOHOL	7.5%
SODIUM CHLORIDE (table salt)	10.0%

This deviation from the composition above above, gives the explosive an excess of fuel which lowers the flame temperature and the sodium chloride further cools the flame temperature. This composition will give a higher percentage of carbon dioxide in the gaseous products yield, but you can't have your cake and eat it too!!!

AMMONIUM NITRATE-ALUMINUM EXPLOSIVE

DETONATION RATE - 2600-3700 M/sec.
DETONATION PRESSURE - 650,000-1,320,000 P.S.I.
SENSITIVITY - Same as Prilled FGAN-#2 fuel oil explosive

USE-

BLASTING - Its use in blasting is limited due to the increased cost of the aluminum component which drives up the cost per cu/ft earth moved. It is, however, better at most tasks than AN-FO explosives. It has a definite potential in blasting very hard rock and in usages where the bore holes are time consuming to prepare. For charge computation, a reduction of 20% in total charge weight can be utilized from FGAN-Fuel oil explosives.

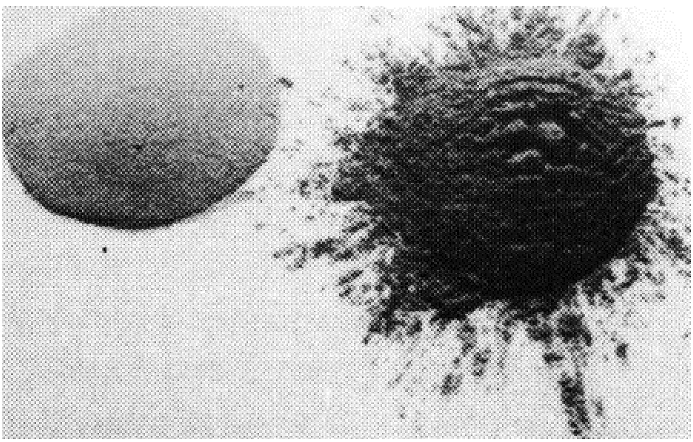
DEMOLITIONS - Surpassed by the powdered AN-AL explosives and other explosive formulations in this book. Best used in below ground usage although in a thin case (6 inch and greater diameter pipe having a thick wall) it can find above ground demolition use. Another interesting use would be in large scale (washtub sized) shaped charges. Most targets could be defeated easily with the exceptions of thick steel or armor plate and very heavily reinforced concrete using 200 Ib. charges with good tamping (surrounding explosive on all sides with the exception of the side of the charge facing the target) and with the correct stand-off distance (distance from target to the face of the explosive). Multipoint detonation would be a must for maximum efficiency.

MUNITIONS - This explosive should be a relatively good choice for loading larger munitions. While none of the ammonium nitrate explosives with the exception of some case AN explosives, some pressed AN explosives and AN explosive containing CHNO explosives are very good choices for munitions this could be used and as a concussion munitions filler. A fifty five gallon drum filled with this explosive should produce blast overpressures in excess of 1000 P.S.I.. This should kill in excess of a 300 meter radius of the point of detonation if laced with detonation cord which would raise the detonation rate of the entire charge. It would also be audible for 5 to 10 miles depending on the conditions existing at the time of detonation (i.e.-atmospheric/ temperature inversion etc.).

This explosive is another composition utilizing the AN in the prilled fertilizer grade. It is a powerful explosive utilizing the great heat of the transformation ot aluminum into its oxidized state. Most people have heard of "Thermite" and the same oxidation which generates the 4000 degree heat in thermite give this ammonium nitrate explosive its greater power and blast coefficient. Ideally these explosives should be mixed with a 20% negative oxygen balance to ensure the afterburning affect of the aluminum powder in the air. This will lengthen the pressure pulse created by detonation. Its manufacture is simple. Prilled ammonium nitrate (fertilizer grade) and aluminum (preferably fine powdered e.g. black German "pyro"grade) are mixed together in a suitable container in the following proportions:

AMMONIUM NITRATE (fertilizer grade 32%+ nitrogen) 82%
ALUMINUM POWDER (200 mesh or greater) 18%

The aluminum powder used ideally should be of a flaked grade (paint grade) which is cheaper than the "black" pyro grade and even the atomized will work well. A lower performance but workable substitution could be made for part of the aluminum powder with small chips (oilfree) of aluminum as produced in a machine shop in turning or bandsawing operations. These components are mixed in a clean dry container. The mixing should be carried out until an intimate mixture is obtained. The different densities of the two components will make this mixing difficult, so the addition of 1% total weight of diesel oil will cause tha aluminum to stick to the granules of ammonium nitrate and raise charge sensitivity. This fuel oil addition will also make the mixture propagate detonation a little better. This explosive composition should be kept dry and free from moisture, as moisture in this composite explosive will start an almost immediate but slow break down yielding hydrogen as a by product. This presence of moisture will also make the explosive difficult, if not impossible to detonate without the use of a very heavy booster charge or charges. One last note, as with the FG AN-FO explosives, this explosives' properties are improved up to 30% by the addition of .5 to 1% "Tide" or "Mr. Bubble" or any detergent containing Sodium dodecyl benzenesulfonate.



(L) Atomized aluminum powder
(R) German flake aluminum powder

PRILLED FGAN-MONONITRONAPATHENE

DETONATION RATE - Dependant on amount of MNN 4200-5700 M/sec.

DETONATION PRESSURE - 725,000-1,600,000 P.S.I.

SENSITIVITY - One #8 cap will detonate but use of a booster (50 G. P. E. T. N., $^{1}/_{2}$ stick hi-vel dynamite) will obtain maximum performance. Higher loading densities (1.4 and greater) will require large boosters and good confinement to perform correctly.

USE-

BLASTING - A good explosive for blasting, but for most purposes ANFO explosives will do as good a job with less work and less cost per Cu/ft. earth moved. Good for blasting tunnels, hard rock and other uses where a shattering effect is required and smaller charges would be more advantageous.

DEMOLITIONS - A better shaped charge explosive than some other explosives listed in this publication due to its higher detonation rate. Not as good as T.N.T. in this respect, but it is a usuable explosive nonetheless. For this purpose, a mold would have to be made to produce suitable charges. Also a good demolition explosive in a stick or cylindrical form. Can be used in the place of a good gelatin dynamite for demolition purposes.

MUNITIONS - One of the better explosives in this book for this purpose. Can be used to load grenades, morter rounds and large caliber shells. Armor piercing ("heat") use should be avoided as the detonation velocity is not quite high enough for good formation of a suitable "linear jet" capable of penetrating thick armor plate. For use, this explosive is loaded while still hot and pressed into the shell or munition desired. Can be hand stemmed (packed) with a wooden or "Teflon" or heat insensitive plastic rammer rod while hot in most munitions with the exception of shells and morter rounds with

Approximate pressure required:

DEMOLITION CHARGES	2000 P.S.I.
GRENADES	2000 P.S.I.
MORTER AND SHELLS	8000+P.S.I.

This explosive is powerful and stable. It should find a good use as its properties are preferable over other explosives in this book. The drawbook of this explosive is the preparation of the mononitronapthalene While it is a simple and safe process, to manufacture this product is not expediant. All in all the process is worth the trouble due to the great increases of the explosives performance over other explosives in this book.

MONONITRONAPATHENE MANUFACTURE

Mononitronapthalene is the product of the nitration of napthalene with a mixed acid mixture of nitric and sulfuric acids at 50 degrees centigrade. Napthalene is a common coal tar chemical. It should be available in the form of moth balls. Check the ingredient lable of moth balls to find the active ingredient.

When the correct mothballs are found with a napthalene active ingredient, they should be acquired. They will then need to be purified. This is not entirely necessary, but will increase the yield on MNN. This can be done by powdering the mothballs and placing the powder in four times the powders weight of petroleum ether or chloroform.

CAUTION: Avoid breathing the dust or fumes and contact with the skin with the acids, mothballs, napthalene and the finished product as they are all dangerous'!!![1]

The powder will all or nearly all dissolve. This liquid should then be allowed to evaporate.

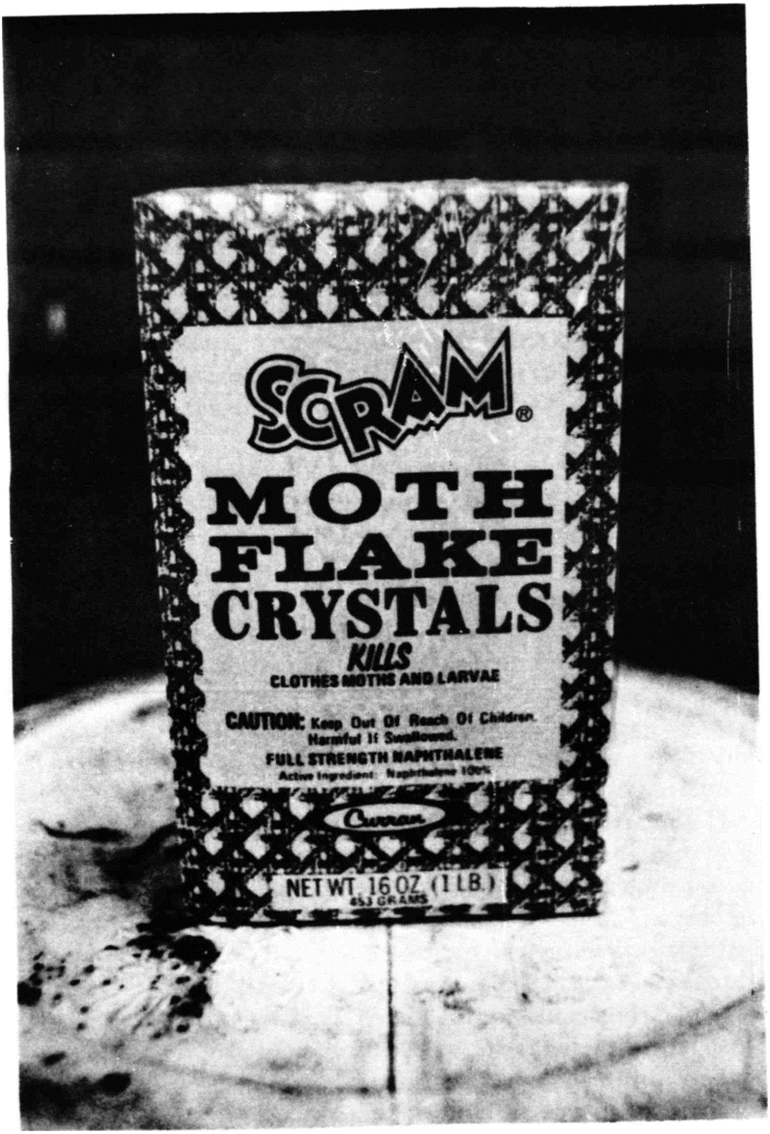
CAUTION: This should be done in a place with good ventilation away from all sparks and flame as petroleum ether is unbelievably flammable!!!!

The yellowish crystals remaining after evaporation should be napthalene that is relatively pure. These crystals are then weighed. In a separate beaker a mixture of 48% Nitric acid and 52% sulfuric acid is prepared. The nitric acid can be the 70% grade which is readily available and the sulfuric should be the 98% grade with specific gravities of 1.42 and 1.8 respectively. All percentages are by weight. To mix these acid care should be taken and they should be poured together slowly. CAUTION: Eye protection is a must!!!! The total weight of the acid will need to be known. Per 100 G. of mixed acid will nitrate 100 G. napthalene. The correct amount of napthalene is then added to the mixed acid eg. 250 G. mixed acid will nitrate 250 G. napthalene. The acid nitration mixture is stirred. A thermometer is placed in the mixture. The beaker is placed on a heat source. An electric hot plate would work fine. The mixture is heated to 75 degrees centigrade while stirring. It is held at this temperature for 30 minutes while stirring is continued. The contents of the beaker is then poured into 3 times its volume of cold water. The mononitronapthalene will immediately drop out of the solution. It is then filtered out and washed twice with cold water and once with warm water. It can be used as is or purified by dissolving in chloroform, diethyl ether or methyl alcohol and allowing the liquid to nearly evaporate completely. The crystals are then filtered out and dried and are ready for use.

One would now be ready to manufacture the finished explosive. The percentages of aluminum powder and MNN can be varied with greater percentages of aluminum giving a greater blast effect. Powdered charcoal can be used in place of the aluminum with lesser performance. Greater percentages of MNN giving higher detonation velocity. Explosive composition is as follows:

FGAN (prilled)	80%
MONONITRONAPTHALENE	10%
ALUMINUN or POWDERED CHARCOAL	10%

This FGAN is gently heated in a suitable container (stainless steel, Enameled steel, pyrex glassware) with a thermometer in place. The prills should be stirred to prevent uneven heating in the container. The MNN is placed in a container as above and heated until melting. When the temperature reaches 115 degrees centigrade, the MNN is added and will melt. This mixture is stirred until a uniform coating of the prills with MNN occurs. The temperature is then reduced to 100 degrees C. while the stirring is continued. The flaked or atomized aluminum powder is added while the stirring is continued. The stirring is kept up until a uniform coating with the aluminum powder is achieved and the explosive is then ready to press in the desired munition.



POWDERED AN-FUEL OIL OR DIESEL

DETONATION RATE - 3600-4750 M/sec.

DETONATION PRESSURE - 578,000-1.087,000 P.S.I.

SENSITIVITY - Cap sensitive when loaded at a density of .86 G/cc or less. Sensitive to a small dynamite booster ($^1/_4$ stick) to loading density of 1.2 G/cc. These figures are for a slightly confined charge (can, bottle or paper tube) at 5 cm. in diameter. Lower loading densities with the "soap" additive will allow a reduction of the useable charge diameter to 4 cm. while retaining #8 cap sensitivity.

LOADING DENSITY - Cap sensitive-.86 G/cc. with addition of .5% "Tide", "Mr. Bubble" or sodium dodecyl benzene sulfonate will allow a higher loading density of .96 G/cc. with #8 cap sensitivity. Loading densities of up to 1.55 G/cc. can be achieved by pressing the explosive into the proper container. At this density these charges will require a large booster ($^1/_2$ stick of gelatin dynamite, 50 grams of either R.D.X., C-4, T.N.T., P.E.T.N. (from det. cord), Picric acid, or other explosives of similar power and detonation velocity).

USE-

BLASTING - Comparable to 40% ammonia dynamite. High gas yield and decent "shattering power". Low cost makes this explosive attractive for this purpose. Also of importance is the ability of this explosive in a cap sensitive loading density to perform the initiation of Prilled AN-fuel oil explosives and other prilled explosives.

DEMOLITIONS - Comparable to 40% ammonia dynamite. With detonation pressures in excess of 800,000 P.S.I, and its low cost this explosive could be useful in demolition in special applications. The powdered AN-AL would be a better choice but the addition of 10-20% total explosive weight of "Bullseye" smokeless powder would bring this explosive into an equivalent of 70% straight dynamite (see formulas below). This would be a better choice for demolition application, but would also increase the cost of the finished explosive by approximately 2000%.

MUNITION - Not really suitable. The powdered AN-AL explosive is a much better choice. Can be used, but better explosive formulations are available.

This explosive has good power and is very cost effective. Its components are readily available and could be obtained without any question. The charge diameter is important as it is with all AN explosives. Charge diameters of 40 mm should be contained in light containers such as beer bottles, empty cans (steel), cardboard shipping tubes or something of similar strength. The 500 ml plastic "Coke" bottles would work fine and are cheap and easily available in useable quantities by a little late night garbage can scrounging. The advantage of these $^1/_2$ liter bottles is the easy attaching of a handle (broomstick) and simple ringing of the outside of the bottle with nails taped or otherwise attached to the circumference of the bottle. This would produce a grenade with a good throwing range and a 3.5-8 meter lethal radius. Varying the size of the nails gives the variations in lethal radius. The explosive filler if the grenade where to be thrown would need some protection to ensure the loading density would not go past the

cap sensitive range upon impact with the ground which would cause a dud. This could be overcome by either using a booster with the cap which would be ideal or the addition of fine saw dust equivalent to 5% total explosive weight in conjunction with the soap additive composition below. This would lessen the tendancy of the explosive filler to pack but would also lower the detonation velocity and effectiveness. The AN-AL powdered explosive would be a good choice also for filling this type of munition.

To manufacture this explosive, take AN which has been previously powdered to a very fine consistancy (see Powdered AN-AL explosive for methods of particle size reduction). To this is added the fuel oil or diesel in the proper amount. This is thoroughly mixed. If desired, the small amount of "Tide" is added to this mixture after it has been reduced to the consistancy of flour. This addition is highly recommended due to the enhancement of the detonation and sensitivity characteristics of the explosive and decreasing somewhat the sensitivity when packed or "dead pressed" with the subsequent loss of sensitivity. Of course this mixture should be kept from all moisture and stored in a waterproof container until ready for use. The explosive consists of the following:

#1

AMMONIUM NITRATE (Fertilizer grade)
Fine powdered 94.5%
FUEL OIL or DIESEL 5.5%

#2

AMMONIUM NITRATE (Fertilizer grade)
Fine powdered 94.5%
FUEL OIL or DIESEL 5.5%
"TIDE", "MR. BUBBLE" or SODIUM DODECYL BENZENE SULFONATE (added to the explosive mixture above so that is consits of .5% of the total explosive weight)

#3

AMMONIUM NITRATE (Fertilizer grade)
Fine powdered 94.5%
FUEL OIL or DIESEL 5.5%
"BULLSEYE" SMOKELESS POWDER (added to the above explosive mixture so that it consists of 20% total explosives weight)

These explosives are in order of power and detonation velocity. #1 being the lowest and #3 being the highest. The addition of the smokeless powder to the explosive formula gives a high explosive of greater detonation velocity than the figures given at the beginning of this section.

POWDERED AN-ALUMINUM

DETONATION RATE - 3400-4600 M/sec.

DETONATION PRESSURE - 700,000-1,350,000 P.S.I.

SENSITIVITY - Sensitive to one#8 cap at a density of .95 G/cc.. Sensitive to 1/4 stick of dynamite or equivalent to density 1.25.

LOADING DENSITY - Cap sensitive .95 G/cc. or less. Booster sensitive density .96-1.25. Density related to detonation velocity up to 1.2 G/cc.

USE-

BLASTING - Comparable to 50% straight dynamite. High shattering effect and long duration pressure pulse. Comparable to AN blasting slurries not containing nitro compounds.

DEMOLITIONS - Comparable to 50% straight dynamite. Good pressure curve but for some demolition purposes is unsatisfactory. Not as high a detonation pressure but has a longer duration. The higher densities of loading even though requiring a booster are the most efficient charges for this useage. Nitro additives would make this explosive a better choice for this field of use.

MUNITIONS - Pressed to a high density (1.35-1.5 G/cc.) this is a good munition filler. Requires a very heavy charge for a booster (R.D.X., P.E.T.N., Comp. B) to ensure a good detonation. Should be pressed into the munition (shell, grenade or bomb). Addition of 10% to the total weight of the explosive below of P.E.T.N. (detonation cord filler), R.D.X. or T.N.T. will give a better shell filler. It will also give an explosive with better less demanding detonation cap requirements. A good filler for offensive grenades due to the tremendous concussive effect.

This explosive has a great blast effect due to the huge amount of high temperature gases (1400-1800 degrees celsius) produced by the detonation process. The pressure wave goes out from an explosion like a ripple from a pebble thrown into a pool of water. The difference in this explosive to others in this book and unaluminized explosives is this wave presses on the target up to four times as long as other explosives. A lower pressure for a longer amount of time will nearly always do more work or damage. The detonation of atomic weapons uses the same long duration lower pressure pulse that we are talking about here. This pulse or shock front is visible at a distance from the point of detonation. If the reader has ever watched films from WWII or the Vietnam police action showing airborne camera footage and noticed the white area of compressed air radiating from the point of detonation of a bomb, you saw a visible shock wave. Imagine this white area 4 times as thick and you'll get "the picture".

This explosives manufacture is simple. The fertilizer grade ammonium nitrate is powdered with a mortar & pestle or ground in a similar manner. This should be done until the consistancy of face powder is obtained. This powdering can also be accomplished by dissolving the AN prills in boiling water (30% water, 70% AN). This liquor might need to be gently heated to get the AN to completely dissolve. This should be done in a pyrex or preferably stainless steel container.

This liquor is then poured in a stainless steel cookie baking tray so that it is 1 / 8 to 3/16 inch deep This tray is then placed in an oven set on the lowest temperature that the oven will operate (160 degrees F, 70 degrees C ideally) This temperature should be checked with a oven thermometer or candy thermometer before the AN liquor is placed in the oven When the proper temperature is achieved, the cookie sheet is placed in the oven with the door slightly ajar to allow the water being driven off to escape This liquor should be allowed to remain in the oven for 18-22 hours The remaining crystals will be very easily broken up and are the ideal crystal structure and size for explosives manufacture

To this powder the aluminum powder is added Pyro grade 400 mesh is the best aluminum for this explosive Atomized grades of aluminum will work, but the highest performance is realized with the pyro aluminum This mixture is tumbled in a sealed container until a uniform mix is obtained *CAUTION Breathing of aluminum dust is hazardous and should be avoided Respirators are cheap and well worth the trouble and expense*

This explosive can be initiated with a blasting cap if the lower densities can be obtained The addition of sawdust is given in one formula below so that the lower densities are ensured The last formulas are given for munition loading The addition of 25- 75% total explosive weight of "Tide" will give an explosive less sensitive to density changes and more sensitive to detonation

#1

AMMONIUM NITRATE (Fert grade powdered) 80.0%
ALUMINUM POWDER
(Flaked prefered, but atomized will work) 20.0%

#2

AMMONIUM NITRATE (Same as in #1) 80.0%
ALUMINUM POWDER (Same as in #1) 15.0%
SAW DUST 5.0%

#3

AMMONIUM NITRATE (Same as in #1) 85.0%
ALUMINUN POWDER (Flaked only) 9.0%
STERIC ACID 6.0%

POWDERED AN-DIETHYLENE GLYCOL

DFTONATION RATE - 3400-4600 M/sec

DETONATION PRESSURE - 650,000-1,040,000 P S I

SENSITIVITY - 95 G/cc is the ideal density to load this explosive At this density the ability to take a detonation impulse from a #6 cap is excellent at a minimum charge diameter of 4 0 cm (1 6") Higher densities while still detonatable will require a 50 G dynamite or other high explosive booster charge

USE-

BLASTING - A good cheap blasting explosive comparable to 50% ammonia dynamite Alcohols and glycols are some of the best fuels for AN explosives The only drawback of this explosive is its relative sensitivity to moisture which can cause charges to become insensitive to a blasting caps' impulse This can be overcome by proper packaging of the final explosive in such a way that moisture imperviation can be obstructed (e g P V C pipe, polyethylene tubes, empty coffee cans, etc)

DEMOLITIONS - Limited in this useage by low velocity and proportionately low bnstance (shattering power) as opposed to other demolition explosives

MUNITIONS - Unsuitable due to sensitive nature and hygroscopic properties

This composition is an interesting one It has good power and is very inexpensive to manufacture One of the attractive properties of the explosive is its high cap sensitivity One #6 blasting cap will detonate this explosive The disadvantages are the relatively hygroscopic nature of the formula The addition of guar gum or other high mole weight polysaccharide will reduce the tendancy for this to occur but this only gives a slow protection from moisture Guar gums are available (eg "Guartec"&"Gengel"TM'S of the Henkel Corp Minneapolis MINN) that will effectively block the migration of moisture into the finished explosive formulation These products find an almost exclusive use in the explosive industry and could possibly arouse suspicion in their acquisition The use of diethylene glycol (antifreeze) as the fuel in the explosive is a good choice This is due to the fact that glycol is a form of alcohol and alcohol is one of the best fuels for AN explosives Also the addition of 1% aluminum raises the total heat of the gases formed on detonation which subsequently give the explosive a greater bnstance As with most of the explosive formulas in this publication the manufacture of this explosive is a simple affair The AN is powdered and the diethylene glycol (antifreeze) is added in the proper proportions and throughly mixed To this mixture the aluminum powder and guar gum are added and mixed to obtain a well blended mixture To this the proper amount of paraffin wax, that has been previously reduced to as small a particle size as possible, is added This particle size reduction can be obtained by rubbing a block of wax against a cheese grater or chopping in a food processor The mixture is then mixed until a uniform composition is obtained This explosive is then loaded into the charge configuration desired (16" or 40mm diameter or greater) at a loading density of 95 G/cc or less The percentages of the ingredients are given below

POWDERED AN (Fert, grade) 90.0%
ETHYLENE GLYCOL (Antifreeze) 5.0%
ALUMINUM POWDER (400 mesh) 1.0%
GUAR GUM 1.0%
PARAFFIN WAX (small part, size) 2.5%

This will give a strange semi-gelatin explosive that is somewhat powdery. It is simply pressed into the container and the explosive is ready to use. Below is another explosive formula that should work well and have a slightly higher performance parameter:

POWDERED AN (Fert. grade) 90.0%
ETHYLENE GLYCOL 5.0%
ALUMINUM POWDER (400 mesh) 2.5%
GUAR GUM 1.0%
PARAFFIN WAX (small part, size) 1.0%

This should be a little less cap sensitive, but will still most likely detonate from a #6 cap except at low temperatures (0 degrees C. and below).

POWDERED
AN-HEXAMETHYLENETETRAMINE ADDUCT

DETONATION RATE - 4050 M/sec.

DETONATION PRESSURE - 725,000 P.S.I, (est.)

SENSITIVITY - Sensitive at a density of .95 G/cc to one #6 cap. Higher densities yield higher detonation rates but are not cap sensitive and require a ^{1}A stick of dynamite booster or equivalent.

LOADING DENSITY - For cap sensitive mixtures loading D. should be held below .95 G/cc. Higher densities up to 1.3 G/cc can be loaded, but detonation sensitivity is such to require heavy boosters.

USE-

BLASTING - Comparable to 40% ammonia dynamite. High toxic fume production of this explosive limits its use to one where prevalent winds can carry these toxic fumes in a safe direction, away from the user.

DEMOLITIONS - Can be used as a 40% ammonia dynamite substitute. Detonation rate is not really high enough for good demolition use.

MUNITION - Required low density for reliable detonation is a limiting factor. For more use information, see Powdered AN-Aluminum.

This explosive is cheap and cap sensitive and these are the major reasons for its place in this publication. It is a powerful explosive and would be an excellent choice for a home blaster.

Hexamethlyenetetramine is quite a mouthful to say but is a perfect fuel for AN explosives due to its high stability. For its manufacture from ammonia water and formaldehyde solution see KITCHEN IMPROVISED PLASTIC EXPLOSIVES. It can also be bought as ration heating tablets from any army surplus store (eg. Hexamine fuel tabs). Also available under the following names: "Ammoform", "Hexamethylenamine", "Aminoform", "Ammoform", "Formin", "Urotropin".

The adduct used in the explosive is simple. Two molecules of AN links with one of hexamine. The adduct is manufactured by simply evaporating the water from 700 G. hexamine/800 G. AN/600 ml. water solution. This evaporation should be done by placing a shallow pan of the dissolved salts in water solution under an electric fan for 24 hours. A slush of crystals with the remainder of the solution should then be filtered. A buchner filter (vacuum filter) is ideal but not necessary. The crystalline substance remaining on the filter should be washed with anydrous acetone. This should remove most of the water remaining in the adduct. The adduct should then be ground with a mortar and pestle to a very fine consistancy. After the grinding or powdering is complete the adduct should be washed once more with fresh anhydrous acetone. This should remove the remaining water from the crystals. They are then pressed, to remove as much acetone as is possible and the adduct is then ready to be incorporated into the final explosive mixture.

The adduct produced is a weak molar explosive and until mixed with AN is very safe to handle. This adduct is then mixed with the proper amount of powdered ammonium nitrate and the mixture loaded into the form in which it is to be used. The explosive composition is as follows:

AMMONIUM NITRATE (Fert, grade)
Finely powdered 80%
ADDUCT (Hexamine-AN) 20%

The explosive should be used in explosive cartridge diameters greater than 1.25 inch or 32 mm.

Simple adduct acetone wash set-up.

POWDERED AN-NITROGLYCERIN

DETONATION VELOCITY -
20% NG-4400 M/sec.
30% NG-5150 M/sec.
40% NG-5700 M/sec.
DETONATION PRESSURE - 400,000-3,500,000 P.S.I.
SENSITIVITY - Sensitive to one #6 cap. Highly shock sensitive. This shock-sensitivity becomes greater the higher the ambient temperature and percentage "nitro". Explosives containing this high a percentage of nitroglycerin are prone to extrude or "sweat" the oily nitroglycerine. This is very dangerous. This extrudation can seep through containers and yield an explosion looking for an unknowing or foolish person to kill. Explosives should be made as needed and not stored. This explosive looses sensitivity as the temperature drops and will become insensitive to one #6 blasting cap at 42 degrees F. or 5.5 degrees C.. Larger booster explosives would be needed to detonate these explosives at this lower temperature.

USE-

BLASTING - Can be used as a dynamite, as in essence that is what this formula is. The formulas below are high velocity, high power explosives. They are great for shattering the hardest rock. For earth moving much cheaper explosives (ANFO) can be used with almost as good a result. The explosive containing the least amount of nitro sensitizer is equivalent to 70% ammonia dynamite and the last composition is equivalent to 80% dynamite.

DEMOLITIONS - Good!!!! For relative powers see the blasting section above.

MUNITIONS - POOR!!!!!!!!!!

These explosives are extremely powerful and dangerous due to the high percentage of nitroglycerin in them. Only a person with experience with explosives would be wise to attempt this manufacture and use of the explosive produced. The manufacture of nitroglycerin can be found in the prilled AN explosive section of this book under PRILLED AN-NITROGLYCERIN. To manufacture these explosives the powdered AN and fuel are mixed. The nitroglycerin is added to the powder and kneaded until a good uniform mixture is obtained. The formulas are as follows:

#1
AMMONIUM NITRATE (Fert. grade)
Finely powdered 72%
POWDERED CHARCOAL 8%
NITROGLYCERIN 20%

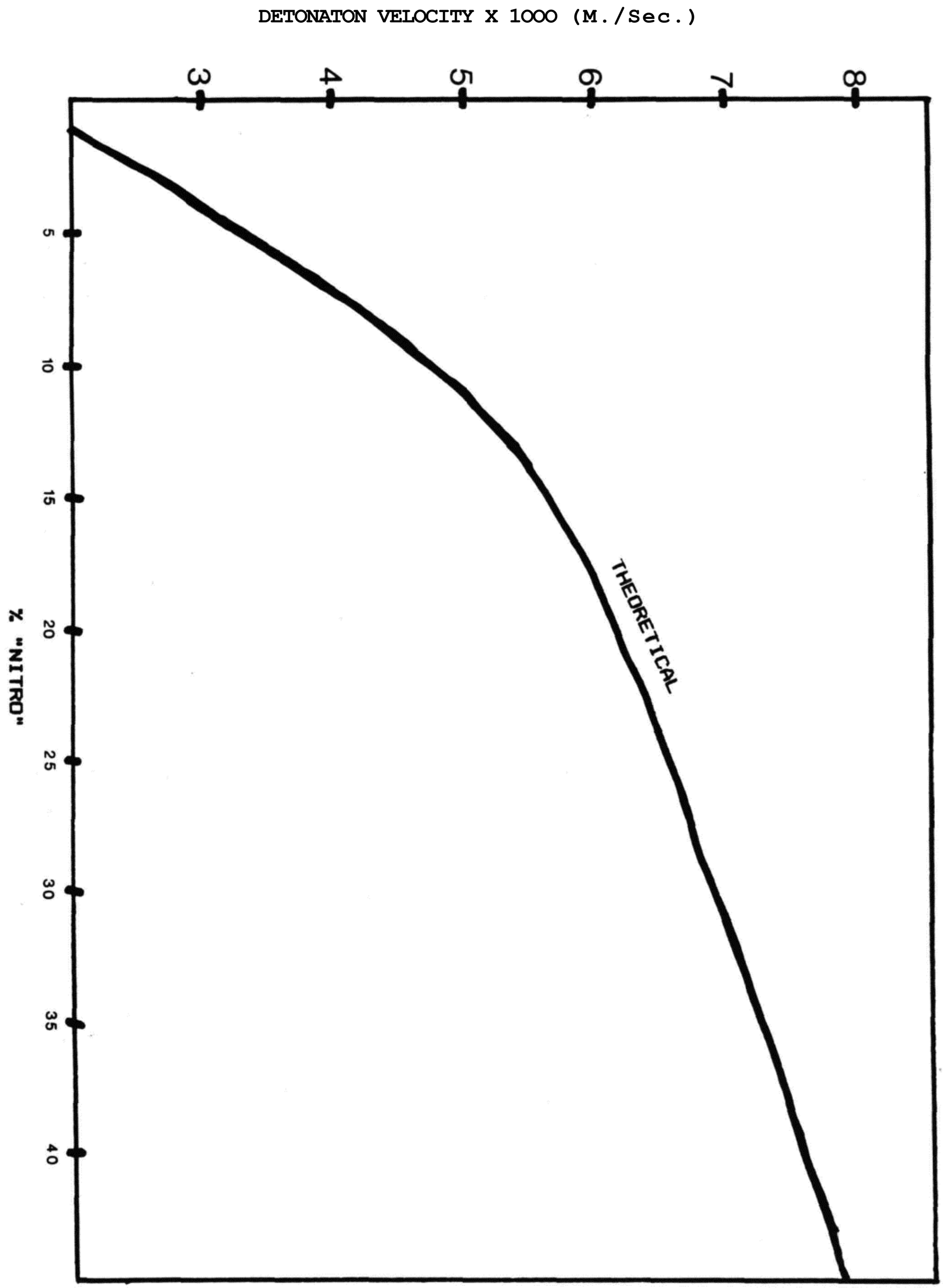
#2
AMMONIUM NITRATE (Fert. grade)
Finely powdered 63%
POWDERED CHARCOAL 7%
NITROGLYCERIN 30%

#3

AMMONIUM NITRATE (Fert, grade)

Finely powdered	54%
POWDERED CHARCOAL	6%
NITROGLYCERIN	40%

The addition of 2-4% total explosive weight of IMR smokeless powder will give an explosive that will not extrude nitroglycerin and is the best way to manufacture this explosive. The substitution of aluminum powder for the charcoal will give higher performance. These explosives are basic dynamites, but have the advantage, that commercial dynamites do not have this much "nitro" in them. These explosives should be pressed gently into a tube with a wooden dowel. P.V.C. pipe available at hardware or plumbing supply stores are a good inexpensive choice for this. Wood dowel must be the only thing used to "press" the exlosive into the pipe for safety's sake. These explosives can also be used to fill shaped charges by very gently pressing them into the molds. For this purpose the addition of IMR smokeless powder should be undertaken.


DETONATON VELOCITY X 1000 (M./Sec.)
3
4
5
6
7
8
THEORETICAL
5
10
15
20
25
30
35
40
% "NITRO"

POWDERED AN-NITROMETHANE

DETONATION VELOCITY - 5700-6900 M/sec
DETONATION PRESSURE - 2,250,000-2,750,000 P S I
SENSITIVITY - One #6 blasting cap will reliably detonate even at low temperatures Loading Density should be around 1 1-1 3 G 'cc

USE-

BLASTING - Too expensive to really be effective for blasting except for special applications requiring the high shattering ability of this explosive

DEMOLITION - Great for most applications Can be considered a T N T equivalent This explosive can be used in shaped charges to penetrate armor plate and heavily reinforced concrete Bristant and very powerful

MUNITION - Unsuitable due to the volatile nature of the nitromethane sensitizer and high sensitivity

This explosive is one of the more interesting binary AN explosives With actual power greater than that of T N T , this explosive could find multiple useages One of the aspects of this binary explosive is its ability to be used in high performance shaped charges Of course, this explosive can not approach the performance of C-4 or other R D X based explosives, but its simple manufacture and location of the components for manufacture make it an attractive alternative The high gas yield of this composition actually gives it greater power than T N T and puts it in the Picric Acid class With the easy manufacture process this explosive would be a good choice for many uses The drawbacks of this explosive are the volatile nature of the nitromethane and the subsequent expense of the nitromethane Both would need to be taken into account The nitromethane could be obtained from a racing supply house as it is a high performance fuel additive A useable form could also be obtained from a hobby store as a high performance model airplane fuel (35% nitromethane) This racing model airplane fuel would of course give a lower performance explosive than the pure nitromethane product This model airplane fuel could be separated by the vacuum distilling of the fuel with two stages in the system The last stage would be super cooled to catch the methanol and nitromethane The changes in pressure would also signal the boiling point changes due to liquid remaining in the flask The first 30% of this liquid can be discarded The remaining liquid to be caught in the second flask should be used to make the final explosive in place of nitromethane that is called for Remaining in the second stage flask is a liquid containing 75% plus nitromethane that would work well in the first formula below A process such as this would take some working with but would give an unlimited supply of surpentuous nitromethane See the diagram that has a flow chart of this process The model airplane fuel could be used as is and would still give good results the formulas below will give a formula for the straight model airplane fuel as the percentages would not be the same

The ammonim nitrate is ground to a very fine consistancy The nitromethane is added and stirred until a uniform mix is obtained This is then loaded by gently pressing in the munition desired A different method can be used and will reduce

the above mentioned volatility and subsequent evaporation problems. The powdered AN is pressed in the desired munition (shaped charge, etc.) or container. Prior to detonation the correct amount of nitromethane is poured on the pressed AN powder and allowed to soak for five minutes and then would be ready to detonate. The explosives consist of the following:

AMMONIM NITRATE (Powdered) 72%
NITROMETHANE 28%

AMMONIUM NITRATE (Powdered) 85%
NITROMETHANE 15%

AMMONIUM NITRATE (Powdered) 70%
MODEL AIRPLANE FUEL
(35% m Nitromethane) 30%

Of the compositions listed, the first is the highest performing of the three. The last will be the lowest with detonation velocities of 6900, 6400, 5700 M/sec. respectively. These are neat explosives that are very cap sensitive and will detonate at high velocities and with great bristance.

POWDERED AN-METALLIC NITRATE

DETONATION RATE - 2900-3900 M/sec.
DETONATION PRESSURE - 700,000-980,000 P.S.I.
SENSITIVITY - One #6 ASA detonator will cause detonation in a 25 mm (1") diameter at loading densities between .9-1 G/cc.

USE-
BLASTING - Great for any use calling for 40% dynamites. Great cap sensitivity and low cost make this explosive very attractive for the home blaster. Also could be used as a booster for prilled AN-fuel oil explosives. This explosive would find use in stumping and other similar applications.

DEMOLITIONS - Very limited in this field due to the low detonation velocity and pressure. Could find specialized uses!

MUNITIONS - Not a good choice as loading density is critical.
A simply prepared explosive with superb cap sensitivity within the proper loading densities. The loading density will need to be closely controlled. This is easily done by loading the explosive in a container of known volume with the correct amount of the sensitized mixture. The manufacture involves simply powdering all the ingredients separately and mixing together until a uniform mixture is obtained. Several different sensitizers with their respective best loading densities will be given below:

#1 LOADING DENSITY-0.93 G/cc.

POWDERED AN (Fert, grade)	90%
HEAVY FUEL OIL	4%
SAW DUST	4%
CHROMIUM NITRATE	2%

#2 LOADING DENSITY - 1.0 G/cc.

POWDERED AN (Fert, grade)	90%
HEAVY FUEL OIL	4%
SAW DUST	4%
FERRIC OR IRON NITRATE OR COBALT NITRATE	2%

#3 LOADING DENSITY-0.99 G/cc.

POWDERED AN (Fert, grade)	91%
HEAVY FUEL OIL	4%
SAW DUST	4%
LEAD NITRATE	1%

These loading densities are the maximums that these charges will take a detonation wave from a #6 cap. Lower density loadings will still detonate, but will give lower performance due to their detonation velocities. These are simple to make and use and would be a good choice for a home manufacturer to "whip up" on short notice for special blasting jobs around the farm or ranch.

POWDERED AN-RED PHOSPOROUS COFFEE

DETONATION RATE - 4600-5600 M/sec.

DETONATION PRESSURE - 800,000-1,250,000 P.S.I.

SENSITIVITY - One #6 blasting cap will reliably instigate detonation even at temperatures as low as -10 degrees F.. Sensitive to shock impact and friction!!!!!!!

LOADING DENSITY - Should be around .9-1.0 G/cc. for maximum performance with charges in the 1.5 inch diameter or greater will propagate detonation.

USE-

BLASTING - Equivalent to 60% dynamite for which charge computation figures can be used. Very sensitive to detontaion due to the low shock threshold.

MUNITIONS - Can be used for this purpose but since the loading density of this explosive needs to be low, it would not be a good choice. However, the detonation releases phosphorous pentoxide, a nasty poison which would, in certain, instances give a secondary poison gas effect to the detonation of this explosive in munitions. Its shock sensitivity limits its use to hand propelled munitions such as grenades.

A simple and powerful explosive easily made in a calindistine setting or by home blasters. While being more expensive than other explosives in this book the speed of manufacture and cap sensitivity tend to offset this expense to some extent. It is not clear exactly what the coffee does to the explosive to positively change the performance, but its addition is a definite plus. This addition of "Instant" coffee to the explosive gives the explosive 50% more power than similar compositions containing only red phosphorous. The manufacture is a simple affair. The ingredients are powdered separately to a very fine consistancy. This can be accomplished by heating the coffee in the oven with the door slighty ajar at 200 degrees F. for 1 hour before grinding it. These finely powdered components are mixed by tumbling together until an intimate mixture is obtained. This should be done in a plastic container to ensure the safety of the mixture!!!!

CAUTION: Red phosphorus is a dangerous compound. Respirators should be worn while handling this component and care taken to ensure that the dust is not ingested, breathed or allowed contact with the skin. DO NOT use any container or other utensil that has at any time been used with potassium chlorate or any chlorate salt. An explosion is a certainty. I have a picture of a bomb squad crewmember with his hand turned into a mist by this compositions'detonation and it does not look at all pleasant.

This explosive formula is composed of the following:

AMMONIUM NITRATE (Fert, grade)
Finely powdered 95.0%
RED PHOSPHORUS. 1.0%
SOYBEAN OIL. 3.5%
DEHYDRATED GROUND COFFEE 0.5%

Care should be taken to avoid breathing the detonation products or gases as they contain highly poisonous phosphorus pentoxide. Although this is a strange concoction for an explosive it is powerful and seemingly a good explosive. It is strange that the addition of "Instant" coffee increases this explosives power by 50%. This is most likely due to the lowering of the loading density brought on by the addition of the low density of dried coffee.

GELLED AN-HEXAMINE-NITRIC ACID

DETONATION RATE - 4400 M/sec. at 3"-5200 M/sec. at 5"
DETONATION PRESSURE - 750,000-1,800.000 P.S.I.
SENSITIVITY - One #8 blasting cap will detonate this explosive.
USE-
BLASTING - Good explosive which is comparable to 70% ammonia dynamite. A good choice for blasting. Storage stable for up to one year in average magazine conditions.

DEMOLITIONS - Good for this use if the charge diameters do not pose a use problem. Good bristance and blast characteristics. Some of the nitroglycerin explosives in this book and the AN nitromethane explosives are better choices but this explosive will work. For shaped charge applications, this explosive does not possess a high enough detonation rate for proper collapse of the liner and subsequent formation of a good high velocity linear jet.

MUNITIONS - Not a good choice due to the highly corrosive nature of the composition.

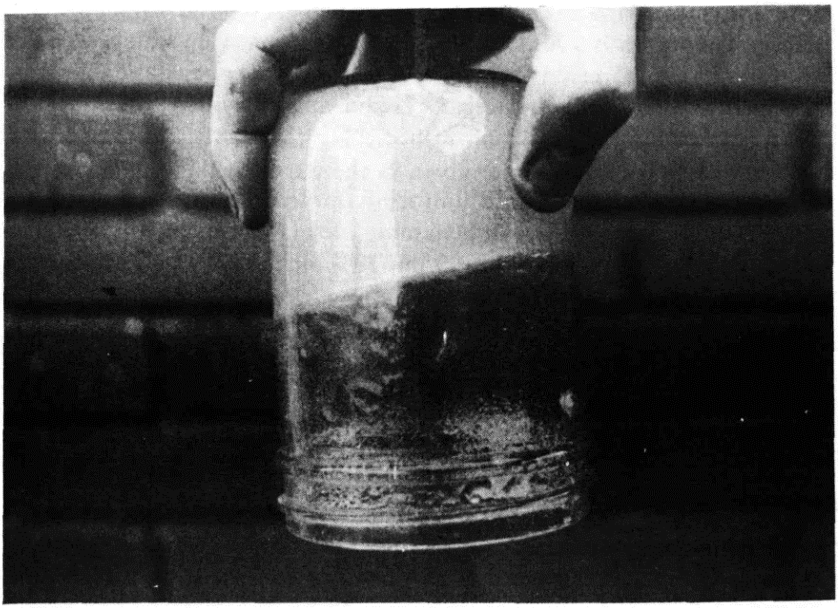
This is an excellent explosive choice for a "home" type manufacture. The only drawbacks of this explosive are its highly corrosive nature and subsequent danger involved in handling nitric acid. It is a gell and was originally developed as an explosive that could be extruded into a plastic tube much like sausage is manufactured. This explosive does need to have a rather large charge diameter for it to reach its maximum potential as an explosive. Larger diameters than 5" will no doubt raise the detonation rate slightly higher than the figures given at the beginning of this section. A seven inch charge diameter could possibly give a detonation rate of over 6000 M / sec.. The manufacture is not as simple as some of the others in this publication. To manufacture, place 1000 G. of prilled ammonium nitrate and 28 G. guar gum in a stainless steel container of 1.5 gallon capacity. Guar gum is a high mole weight poly saccaride which, when mixed with water at low percentages gives a stable and water resistant gell. It is used extensively in food processing (e.g. ice cream, dairy products, chewing gum etc.) and as a thickening agent in oil well drilling fluids. It is obtained locally if possible, but major sources are given in the pages of this publication. These should be stirred together until uniformly mixed. To this is added 340 cc of water, 240 G. hexamine (methenamine, see AN-Hexamethylenetetramine adduct), 117m. 54% nitric acid (90 ml. 70% nitric acid and 27 ml. water will work). *CAUTION: Wear gloves and eye protection and work with good ventilation and be prepared to wash any composition off as soon as possible.* To this add an additional 2240 G. of ammonium nitrate prills. This is blended together and allowed to stand. The mixture will begin to gell. After is has started to thicken noticeably, add 120 G. chromic acid, 280 G. zirconium sulfate and 120 G. aluminum sulfate. This will produce 9.94 Ibs. of explosive gell at a density of 1.3 G/cc.. This explosive is cap sensitive, but the explosive should be capped only immediately before actual detonation due to the corrosive nature of the composition on the detonator shell. This is an interesting explosive due to the balancing of the positive and negative heats of solution. The hexamine forms with the nitric acid, a sensitizer which is in the fammily of R.D.X. explosives.

This explosive is cheap and storage stable for 9-12 months at standard temperature (70 degrees F.). For use, it can be packed into a suitable container with an inside diameter of 3" or greater. If any amount of time is expected to pass before the charge is to be detonated, care should be taken to ensure that the container will not be affected by the corrosive nature of the explosive formulation. Below once again is the composition of the explosive in percentages, instead of the particular batch weights given above:

POWDERED AN (Fert. grade)	25.0 parts
GUAR GUM	7 parts
WATER	8.5 parts
HEXAMETHYLENE (Hexamine)	6.0 parts
NITRIC ACID (HNO3)	3.8 parts
POWDERED AN (Fert. grade)	56.0 parts

CHROMIC ACID	3%
ZIRCONIUM SULFATE	7%
ALUMINUM SULFATE	3%

The last three ingredients are given in percentages as they comprise a ratio of gelled explosive to their interligation properties. The first six ingredients are prepared with the total weight known, then the percentages of the last three ingredients will give the correct amount of these ingredients to add to finish the explosive composition.



Water gelled with 3% guar gum.

POWDERED AN-HEXAMINE OR UREA GEL

DETONATION RATE - 4850-5600

DETONATION PRESSURE - 1,000,000-1,300,000 P.S.I.

SENSITIVITY - One #8 blasting cap will detonate this explosive in 1.5 inch (4 cm.) diameter columns but 25 G. boosters of dynamite will give the higher detonation velocity figures.

USE-

BLASTING - A high performance explosive that compares favorably with high velocity gelatin dynamites in power. While velocity is not as high, the actual ability to do work is slightly higher. Not quite as bristant (shattering power) as high velocity gelatin dynamites, this is not really as good a hard rock blasting explosive but will work very well at this usage.

DEMOLITION - A good choice for ammonium nitrate explosive not containing "nitro" compounds from this book. Good velocity for a dynamite type explosive. While the detonation rate is not as high, the blast pressures set up by detonation of this explosive will do more actual work. Charges will need to be stemmed for best results and a well stemmed charge will perform as well as the better high velocity dynamites. This explosive will give a longer duration high pressure detonation zone than will the higher "nitro" containing dynamites

MUNITIONS - Not a good choice.

This is a good explosive, but the manufacture method is a little more dangerous than the others in this publication. The danger rises from the fact that heating ammonium nitrate in the presence of fuels can cause the premature detonation of the charge or explosive therein. The basic idea behind this explosive is the intimacy of the oxidizer (ammonium nitrate) with the fuel (hexamethylene - "hexamine" or urea). The urea fuel sensitizer is the best all around choice, although performance is somewhat lower. Urea fertilizer will work and is relatively cheap and easily obtainable. This fertilizer would be obtained by asking the nursery or feed store for some 45-0-0 urea fertilizer which they would be more than happy to sell to a customer for his yard. The urea could also be had by urinating in a shallow pan and allowing this to completely evaporate. The urine of a person eating a high percentage of proteins and a low amount of sugars and carbohydrates gives the best urine for this purpose. Not really liking the smell of urine, I would tend to want to purchase my urea, as it should cost around $10.00 U.S. which would be worth the price. The hexamine sensitizer, while giving the highest performance, is also the most dangerous to work with, as it requires higher "melt" temperatures. Two different compositions will be given for each of these explosives.

The procedure is simple. The first addition of AN and fuel (urea or hexamine) and the "Tide" (sodium dodecyl benzenesulfonate) are powdered and mixed together. These are placed in a stainless steel pan. A candy thermometer is placed in the mixture so that it will go completely to the bottom of the mixture. The container is then place on a heat source that is easily and accurately controlled (e.g. electric hot plate). This is heated slowly until it begins to melt (100 degrees C. urea, 170 degrees C. Hexamine). This is where the danger lies. At this

temperature, 170 ammonium nitrate has been known to explode on rare occasions. The temperature should never be allowed to go higher than 175 degrees C.. The urea should be safe throughout this manufacture step due to its lower melt temperature. When the mixture has completely melted it is then poured on a stainless steel cookie sheet or similar corrosion resistant surface. The cookie sheet should be set in a shallow pan of water to make the molten salts cool as they are poured into the pan. The thinner the layer of crystals in the bottom of the pan the better. After these crystals cool, they should be powdered in small amounts by some method (morter and pestle, rolling pin on hard surface, etc.). Then, to the correct percentage of this mixture, is added the following powdered ingredients: Ammonium nitrate, saw dust and sodium nitrate. These are mixed well. To complete, the explosive guar gum is added and mixed well. Water is added in which the potassium chromate is dissolved and the whole mess is mixed well. The ingredients are as follows:

#1

67%

AMMONIUM NITRATE (Fert, grade) Finely powdered	91.2%
HEXAMINE (Methenamine)	8.5%
"TIDE" laundry detergent (sodium dodecyl) (Benzene sulfonate)	0.3%

33%

AMMONIUM NITRATE (Fert, grade) Finely powdered	8.9%
SAW DUST (Wood flour)	7.4%
SODIUM NITRATE (Powdered)	11.9%
GUAR GUM	0.3%
POTASSIUM CHROMATE (Dissolved in H20)	0.2%
WATER	4.4%

#2

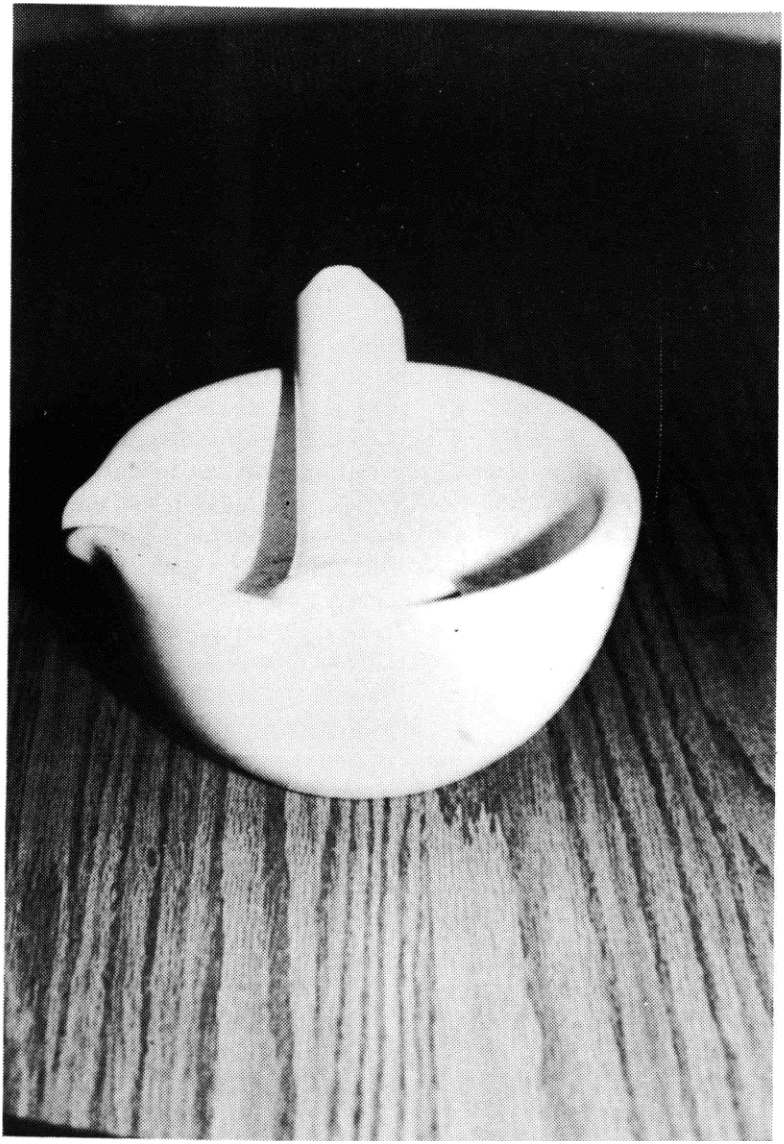
67%

AMMONIUM NITRATE (Fert, grade) Finely powdered	80.0%
UREA (Fert, grade or other source)	20.0%
"TIDE" laundry detergent (Sodium dodecyl) (Benzene sulfonate)	0.3%

33%

AMMONIUM NITRATE (Powdered)	8.9%
SAW DUST (Wood flour)	7.4%
SODIUM NITRATE	11.9%
GUAR GUM	0.3%
POTASSIUM CHROMATE (Dissolved in H20)	0.2%
WATER	4.4%

These explosives, # 1 & #2, should have a density of around 1.2 G/cc. and have detonation rates of 5600 M/sec. and 5100 M/sec. respectively. As stated above, caps will detonate, but boosters of 25 G. are recommended and will give the higher detonation velocities. While these explosives are really a wet blasting agent they do not really fall into the category of slurry explosives either. A good explosive choice and the urea formulation is recommended due to the much safer nature of its manufacture.



GELLED AN-ETHYLENE GLYCOL SMOKELESS POWDER

DETONATION RATE - 5400 M/sec.

DETONATION PRESSURE - 1,300,000 P.S.I.

SENSITIVITY - Not cap sensitive, requires a booster (1/4 stick of dynamite or equivalent).

USE-

BLASTING - A good explosive which can be extruded into a polyethylene tube to form ready made dynamite sticks. Also a useable explosive in that it can be pumped directly into the bore hole if excess moisture is not present. Comparable in power to 60% gelatin dynamite.

DEMOLITIONS - Useable in this field but definitely limited in its application. Best used in the form of sticks (polyethylene tubes or P.V.C. pipe). Comparable to 60% gelatin dynamite, but charge weights should be increased by 15% to make up for the lower rate of detonation.

MUNITIONS - Unsuitable!!

This is a gelled aqueous slurry explosive, this formulation contains a metallic nitrite which generates small gas bubbles in the explosive gel matrix. This lowers the specific gravity or density of the explosive and the gas bubble takes advantage of the "hot spot" theory of detonation. This gives a much more sensitive and higher detonation velocity explosive. Again guar gum is used as the thickening agent o/gelling agent. This slurry explosive is manufactured in a simple process. The ammonium nitrate, sodium nitrate and smokeless powder are slurried with water at 100 degrees F. (38 degrees C.). To this slurry is added the sodium nitrite. Then with a dropper and P.H. paper acetic acid is added until the P.H. is between 4.5 and 5.0. (NOTE: E. MERRICK makes a very accurate and easily read P.H. paper with which you simply dip and read by comparing the four colors with a chart). The first addition of guar gum and ethylene glycol (antifreeze) is then made. This is followed by another addition of ethylene glycol and guar gum. The thickened explosive is stirred until uniform and is then ready for either loading into cartridges or directly into the bore hole or target. The composition is as follows:

AMMONIUM NITRATE (Fert, grade)	41.7%
SODIUM NITRATE (NaNO3)	13.0%
WATER	17.0%
SMOKELESS POWDER ("Bullseye")	25.0%
SODIUM NITRITE (NaNO2)	0.065%
ACETIC ACID	Add to adjust P.H.

GUAR GUM	0.7%
ETHYLENE GLYCOL (Antifreeze)	2.1%

GUAR GUM 0.08%
ETHYLENE GLYCOL (Antifreeze) 0.4%

This is a good slurry explosive. It has a higher cost, as the smokeless powder it contains drives the cost up. It has good shattering characteristics and high performance for a slurry and is easily prepared in a short amount of time by anyone that would desire to do so.

Spooning a mixture into a P.V.C. pipe.

GELLED AN-MONOMTETHYLAMINE NITRATE GELATIN

DETONATION VELOCITY - 5600-6400 M/sec.
DETONATION PRESSURE - 1,500,000-2,200,000 P.S.I.
SENSITIVITY - One #8 cap will reliably detonate these compositions.

USE-

BLASTING - These are the basic explosives of Du-Ponts "Tovex" series of explosives. They are cheap and powerful with good magazine life. These, while not the perfect explosives, would find many uses in blasting.

DEMOLITIONS - Powerful and good sensitivity make these explosives good choices for some "demo" applications. Their water gell tendancies limit usage, but they are easily made and cap sensitive.

MUNITIONS - Unsuitable for most applications. Perhaps large antipersonal bombs could be fabricated and would kill on blast alone.

These are very similar in composition to DuPont's "Tovex" explosives. The "Tovex" line of explosives are water gells that are sensitized with the addition of monomethylamine nitrate. This gives sensitive compositions with very high detonation rates for AN explosives. The MMAN is very stable in heat and storage tests, the only problem with these explosives would be the creation of a stable gell matrix. Most water gells have poorer storage life than other explosives but their low cost and good performance are unequalled for the cost. This explosive in DuPont's eyes is as good as any dynamite and many different grades are available. They were so impressed with them that they dropped their nitroglycerin based dynamites in favor of this explosive group. Of course, I am sure that these are cheaper to manufacture than the "Nitro" based dynamites. They also are very easy for the home manufacturer to make.

The process to make the MMAN is given on page 67. The cast explosive in that chapter is some 30% MMAN and 70% AN. This process would be used to produce the clear liquor containing the two major products. Removal of all the water is not necessary. 10% of the water should remain in the liquid. This can be achieved by removing water until a density of 1.45 is reached. This will give 10% water roughly. To this is added the guar gum and aluminum powder. This should all be mixed very well. This explosive will require a large booster as its density is too high to be cap sensitive. To make this explosive cap sensitive, add resin microballons, glass microballons, powdered styrafoam or pearlite. Resin microballons are hard to come by, but pearlite and styrafoam are not. Styrafoam packing "peanuts" could be used or pearlite which is available at local gardening centers. This addition will lower the density. Enough should be added to lower the density to between 1.1 and 1.25 G./cc. Resin microballons are hard to find, but for information on powdering styrafoam see page 56 and 57 (e.g. Prod. # C-15/250, 3M Corp. Minneapolis, MN).

#1

LIQUOR FROM PAGE 68 (10% H20)	95%
ALUMINUM POWDER	3%
GUAR GUM	2%

#2

LIQUOR FROM PAGE 68 (10% H20)	94%
ALUMINUM POWDER	3%
GUARGUM	2%
10% POTASSIUM CHROMATE AQUEOUS SOL.	1%

The first composition will not have a long storage life due to the break down of the gel matrix. The second formula is crossed linked with potassium chromate which will give a storage stable explosive. The density, as mentioned earlier, is critical if cap sensitivity is needed. The manufacturer would have to control this density in a batch by batch process.

AN SLURRY COMPOSITION #1

DETONATION VELOCITY - 4800 M/sec.

DETONATION PRESSURE - 580,000-1,100,000 P.S.I.

SENSITIVITY - Requires at least a one pound high explosive booster. Critical charge diameter (unconfined) 6 inches. Addition of 2% aluminum powder will give a slurry that will still detonate at 5 degrees C..

USE-

BLASTING - Good cheap explosive slurry. Good power and decent propagation at lower temperatures. Easy to load and use, but requires a good sized booster to ensure detonation. A good choice.

DEMOLITION - Little or no use, except in very special circumstances.

MUNITIONS - Good filler for large (200-15,000 pound) concussion bombs like the "Big Blue 62" or "Daisy Cutter" munition.

A good, easily prepared high explosive slurry. Cheap and easily manufactured. A good choice for most earth moving, pond blasting, ditching (large) and other similar applications. For more information see the DuPont "Blaster's Handbook". This slurry is "cooked up" in the following procedure.

The ammonium nitrate and the sodium nitrate are dissolved in water at 60 degrees C. to form a thich solution. To this is added sulfur, powdered gilsonite (uintaite a form a asphalt obtained from the Unita Valley in Utah) and starch. I believe that any form of asphalt will work if the particle size is reduced enough. Then the guar gum (thickner) is added and the mixture is well mixed. This will give a thick slurry in approximately 5 minutes. This explosive is composed of the following:

AMMONIUM NITRATE (Fert. grade)	54.0%
SODIUM NITRATE	19.0%
WATER	13.5%
SULFUR (Flowers powdered)	4.0%
GILSONITE (Asphalt powdered)	4.5%
STARCH (Corn starch)	3.0%
ALUMINUM POWDER (400 mesh-optional)	1.5%
GUAR GUM	0.5%

This explosive can be just poured into the bore hole if water is not present. It will work in a wet environment, but the longer the exposure to moisture, the less performance can be expected. The best application in a wet bore hole is to place the slurry in a poly ethylene tube or a trash bag to protect the explosive from the adverse affects of the water.

AN SLURRY #2

DETONATION VELOCITY - 400-4600 M/sec. at Density 1.3 G/cc.

DETONATION PRESSURE - (est.) 1,000,000 P.S.I.

SENSITIVITY - 25 g. of dynamite are required for detonation when prepared with small particle size aluminum powder (300 mesh). Larger aluminum powder yields an explosive that requires more than 100 g. dynamite for detonation.

USE-

BLASTING - Great for blasting high detonation rate and comparable in power for 60% ammonia dynamite. Not water resistant. Requires protection from moist boreholes. Powerful and cheap. Must be used in 5" diameter charge or greater.

DEMOLITIONS - Very limited use.

MUNITION - Limited if any.

A simple slurry like explosive without guar additives. The lack of guar gives a slurry with less viscosity and more fluid characteristics. One of the more simple slurry explosives - it is a good, powerful explosive. Detonation propagation is good in larger charge diameters.

The water and starch are mixed together. To this is added the ammonium nitrate (fine powder), '"Bullseye" smokeless powder and 400 mesh aluminum powder. The slurry like mixture is mixed until uniform and is then ready for use. The composition is as follows:

WATER	17%
FLOUR (Wheat, common bleached)	4%
AMMONIUM NITRATE (Fert, powdered)	66%
"BULLSEYE" SMOKELESS POWDER	10%
ALUMINUM POWDER (400 Mesh)	3%

This explosive has propagated detonation in 1.375" I.D. (35mm) pipe with a % inch wall. Therefore this explosive will work fine in this size or larger bore hole. A good choice for small blasting jobs requiring a small bore hole explosive slurry.

AN SLURRY #3

DETONATION VELOCITY - 4500 M/sec. at 32 degrees C.
DETONATION PRESSURE- 1,100,000 P.S.I.
SENSITIVITY - One #8 blasting cap in a density of 1.2 G/cc..

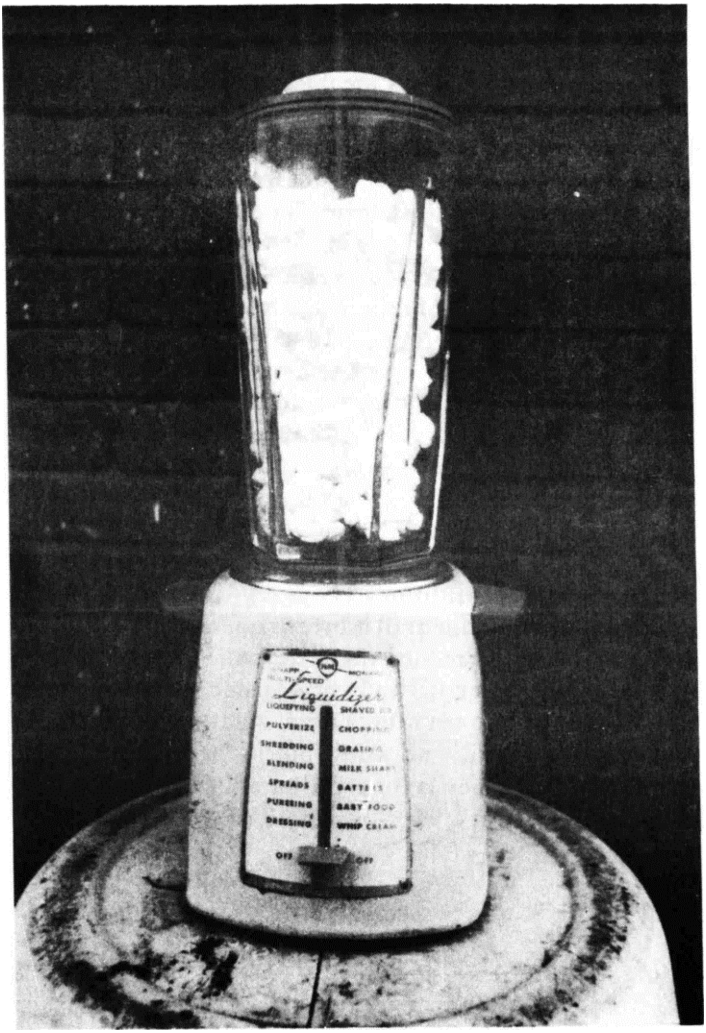
USE-
BLASTING - Similar to slurries # 1 and #2. A good, cheap blasting agent that is sensitive to conventional caps.
DEMOLITIONS - Limited.
MUNITIONS-Limited.

A cap sensitive slurry in which the density is controlled by the addition of gas encapsulating substances (Marrow of sugar cane). This slurry has fairly good storage properties and decent shelf life due to the "crosslinking" of the slurry with the potassium chromate solution. This "crosslinking" simply locks the gellitizing agent into its gelled state by not allowing the hydration of the polysaccharide gum to loose its hydrogen attraction. This is what gives this explosive a good storage life. The fuel in this slurry is sugar (sucrose or cane sugar). This slurry is attractive as it does not require expensive aluminum additives, yet it loses very little performance due to this change. This explosive slurry has good water resistance due in part to the crosslinking of the aqueous blasting agent. This is a very good choice from the point of manufacture, sensitivity, stability and ease of acquisition of the main ingredients.

The ammonium nitrate (Fert, grade) and sodium nitrate are dissolved in the water, which is heated until all of the ammonium nitrate dissolves and the heating slowed. To this is added the cane sugar. The temperature of the mixture should be kept at 65 degrees C. throughout the remainder of the mixing process. The sugar cane marrow, "Tide", stearic acid and guar gum is added. The mixing is continued until the composition is uniform. To this is added the 5% aqueous solution of potassium chromate in an amount of 450 CC to every 50 KG. of finished explosive. It does not take much! The sugar cane marrow can have styrafoam beads as a substitution. These beads could be made by rolling or tumbling common styrafoam until it breaks up into small pelleted size (1 mm). Perhaps the best way to reduce the styrafoam to small sizes is by placing styrafoam pieces in a blender and the blender turned on to high until the styrafoam is chopped into very fine pieces. Addition of pearlite in place of the sugar cane marrow would also work, but its particle size might need to be reduced in the same manner as the styrafoam. Pearlite can be obtained from a garden store or nursery at a very low cost. The composition of the slurry is as follows:

AMMONIUM NITRATE (Fert.)	56%
WATER	14%
SODIUM NITRATE	15%
CANE SUGAR	8%
SUGAR CANE MARROW OR STYRAFOAM	3%
"TIDE"	1%
STEARIC ACID	3%
GUAR GUM	1%

This slurry, when loaded in 150 mm cylinders (5.9 inches), can be exploded by standard blasting caps at temperatures as lows as 4 degrees C.. Detonation velocities at 32 & 4 degrees C. are 4500 M/sec. and 4150 M/sec. respectively.



Setup to powder styrafoam in a blender.

AN SLURRY #4

DETONATION VELOCITY - 4600-5500 M sec.

DETONATION PRESSURE - 800.000-1,300,000 P.S.I.

SENSITIVITY - Requires a 50-100 G. booster of high explosive such as Comp. "B", T.N.T. or high velocity dynamite at density 1.4 G/cc. and in a 6 inch diameter charge.

USE-

BLASTING - Similar to "Aquanal" slurry in power and useage. This slurry is not quite as resistant to water as is the "Aquanal" slurry. Good water resistance can be had and high densities are also attainable allowing this slurry to be used in wet bore holes. Charges should be fired as soon as possible.

DEMOLITIONS - Limited.

MUNITIONS- Limited.

This is a neat blasting slurry that makes use of the ability of water to furnish oxygen to the explosive reaction. The fact that water and aluminum powder will detonate, reinforces this statement. Aluminum has a great tendancy to oxidize especially in the presence of water. This is overcome in this formulation by coating the metal additive with a substance that gives a water repellant tendancy to the aluminum. Uncoated aluminum containing slurry type explosives will have a very short storage life and during storage tend to evolve or "give off hydrogen gas which is not very desirable. Generally the percentage of coating agent is very small (e.g. 1%). This coating seems to give this slurry the ability to detonate, even in charges as small as 2.5 inches (6.3 cm), but the highest detonation velocity will not be achieved at this small diameter loading. This gives this explosive an added ability of being loaded in small diameter boreholes directly and should be pumpable with a diaphragm type pump.

The aluminum is coated by either tumbling the coating agent with the aluminum (Gilsonite, stearic acid or calcium stearate) or by dissolving the coating agent in a solvent and mixing with the aluminum and allowing the solvent to evaporate ("Bullseye" smokeless powder-acetone or paraffin-gasoline). The amount of coating should be $^{1}/_{2}$ to 1% total weight of the aluminum powder, thus the powdered ammonium nitrate, sodium nitrate and sulfur are mixed together. To this is added the water and aluminum that has been previously mixed together. This solution is heated to 45 degrees C. (113-115 degrees F.). To this solution is added the remainder of the sulfur. Then the powdered coal and the guar gum are added and the viscous liquid mixed well. The slurry consists of the following:

AMMONIUM NITRATE (Fert, grade)	42.0 %
SODIUM NITRATE	11.1%
SULFUR (powdered)	
1st addition	7.0%
2nd addition	6.0%
WATER	15.0%
ALUMINUM (powder 300 mesh)	16.2 %
POWDERED COAL	2.2%
GUAR GUM	0.5%

This will provide a thick slurry, sensitive in small diameters. Good power and water resistance are also advantages. This slurry requires heavy boosters, but one stick of gelatin dynamite will work well.

CAST AN EXPLOSIVE-FOAMED

DETONATION RATE - 4300-4700 M/sec.

DETONATION PRESSURE - 800,000-1,400,000 P.S.I.

SENSITIVITY - Sensitive to one #6 blasting cap at densities of .95 G/cc or less. This foamed cast explosive is sensitive to a dynamite booster at a density of 1.25 or less. These figures are applicable at a charge diameter of 2 inches (5 cm.) or greater.

USE-

BLASTING - Very useful in blasting due to the ability to lend itself to multi charge diameter and a variety of charge configurations. Also a good choice for a booster type explosive for the prilled AN-fuel oil type explosives at a low cost. Charge diameter should be 2" or greater. Comparable to 50% ammonia dynamite.

DEMOLITIONS - A useable explosive for some "demo" applications. The ability to conform to a variety of shapes and its relative ability to resist "dead pressing" or packing to an insensitive and undetonatable density. While the detonation rate is not as high as could be obtained, this explosive is cheap and could be produced in a great bulk. It does not have a shaped charge application in modern terms (e.g.: concrete breaching, steel plate perforations, etc.). but in large quantities it could be used effectively. However, the greater bulk (washtub sized shaped charges) and weight of the demolition charges would not be feasable for an underground group, except in special instances, as they would depend upon hit and run tactics.

MUNITIONS - Could very easily be used in cast iron or similar fragmentation charges. Any application of AN explosives metal fragmentation ordinance needs to be painted inside with asphalt or an epoxy type paint to eliminate the corrosive action of the salt on the container.

CAUTION: Ammonium nitrate should never be in contact with copper or brass, as potentially dangerous salts could be formed which could result in the premature detonation of the charge!!!!

This explosive, of course, is not as good a fragmentation explosive as T.N.T., due to its lower detonation rate. Although prefragmented explosive devices could be fabricated easily with something like roofing nails or some other potentially lethal projectiles. This explosive is unsuitable for projectile loading of any sort.

Cast AN explosives have always had a bad reputation for their tendancies to be overly insensitive to even rather large boosters. This seeming inability to achieve a complete or efficient detonation is a curse of cast AN explosives. This composition and its manufacture procedure seems to give a cast charge that is sensitive to a blasting cap and will propagate detonation in a container of very little strength (e.g.; tin can, bottles, paper tubes, etc.). This great increase of sensitivity is achieved by lowering the density of the explosive charge. This is accomplished by the addition of small bubbles of gas in the molten AN-fuel as it cools. The bubbles of gas are formed in a reaction between the AN and a

carbonate, bicarbonate, peroxide, metallic oxide or one of two gas generating nitrates. When the manufacturer "gets the hang" of pouring at the proper temperature, the bubbles dispersed throughout the cast explosive will be of surprising uniformity. Since most shaped charges are formed by casting, this will give the home manufacturer a way to make "homemade" shaped charges. Of course, the detonation velocity is too low for a good effective shaped charge, but the low cost of the explosive allows the use of charges much larger (washtub sized) than would be needed with equivalent CHNO explosives (T.N.T., R.D.X., comp "B", etc.). A washtub shaped charge of this type would be in the 50 to 80 Ib. size range and would be large enough to do a great deal of destruction. Also this size munition could be used by filling the shaped charge cavity with nails, bolts, nuts, glass, wire, ball bearings, BB's and anything else that would make good fragments. This would, in effect, create a huge claymore mine with several hundred meter effective range. To manufacture this explosive, proceed as follows:

The volume of the container, in which the charge is to e cast into, should be measured. This can be done easily by filling it with water, making note of how much water it takes to fill it. Since water is a standard for density and one cc weights equals one gram, this is easy to do:

One gallon = 3584 grams = 3584 cc.
One quart = 896 grams = 896 cc.
One pint = 448 grams = 448 cc.
One fluid ounce = 28 grams = 22 cc.

After the volume of the container has been figured, the amount of explosive would be figured, this is done by multiplying the number of cc. in the container by the density desired as done below:

EXAMPLE:
V = Volume of container = 454 cc.
D = Density of charge desired - .95 G/cc
V x D = Amount of explosive required
454 x .95 = 431.3 G. explosive

It is a good rule of thumb in calindistine explosive manufacture to manufacture only one device at a time. Of course, it would go without saying, the container should be dried out after the water measuring and would be clean enough to "eat out of".

The explosive weight is known and the proportions should be figured from this. The ammonium nitrate (87.9%) is placed in a stainless steel container. The water (5.15%) is then added with distilled water being used whenever possible. A candy thermometer is placed in the container so that it goes all the way to the bottom of the stainless steel melting pan. Place the pan on a heat source which can be controlled easily. A good heat source is an electric hot plate. The hot plate is turned on and the mixture heated to 130 degrees centigrade (266 degrees F.).

This heating should be done slowly so that potentially explosive "hot spots" will not form due to uneven heating. A slow and even heat will work best.
CAUTION: The hot salt is a burn hazard and contact with is should be avoided and safety goggles, gloves and appropriate clothing should be worn.

After the temperature of 130 degrees C. has been reached, this temperature is held for 5 minutes to ensure the complete solution of the AN in the hot liquid. The temperature is then allowed to fall to 110 degrees C. and at this temperature a thick slurry or mush about the consistancy of thin oat meal will form. To this slurry is added the wax fuel (5.72%) and n-Octadecylamine, "Mr. Bubble" or "Tide" (0.25%). This is stirred rapidly to form an emulsion or intimate mixture of the AN-water solution with the molten wax. The foaming agent will aid in the formation of a good emulsion with good stability and will hold this emulsified state until the explosive is cooled in the mold. The molten explosive is then taken off the heat source and the foaming agent (1 %) added. The foaming agent can be one of the following substances:

H_2O_2 - Hydrogen peroxide 30%
Na_2O_2 - Sodium peroxide
BaO_2 - Barium peroxide
$NaNO_3$ - Sodium nitrate
$Ba(NO_3)_2$ - Barium nitrate
NH_4HCO_3 - Ammonium bicarbonate
Na_2CO_3 - Sodium carbonate
$NaHCO_3$ - Sodium bicarbonate

Of the foaming agents the sodium nitrate and the sodium bicarbonate (baking soda) are the most attractive from the standpoint of easy acquisition. As the foaming agent is added, the mixture will begin to foam. Immediately after this addition, the pouring should be done. Then the explosive should foam up and cool before it has time for the bubbles within to escape. Varying the pour temperature may help control this. This will not help as much as keeping the mold cold or surrounded by ice water or cold water. This will cause the explosive melt to solidify more rapidly, thus trapping more gas in the explosive charge. The wax fuel could be replaced with aluminum powder (400 mesh) and a higher power more bristant explosive can be had. Again the ingredients of this explosive will be listed below:

#1

AMMONIUM NITRATE (Fert, prills)	87.9%
WATER	5.15%
WAX	5.72%
EMULSIFIER	0.25%
FOAMING AGENT	1.0%

#2

AMMONIUM NITRATE (Fert, prills)	83.0%
WATER	4.86%
ALUMINUM POWDER (400 mesh)	10.9%
EMULSIFIER (Not essential)	0.25%
FOAMING AGENT	1.0%

The second formula is the best, performance wise, but is not as stable in even short term storage as is the first. In the second formula the emulsifier is not essential, but will yield a more cap sensitive explosive and will ensure a better mixture of the molten salt and the aluminum fuel. This process will produce cast charges of a densities 0.68-1.34 and in a 2" diameter charge will be sensitive to a blasting cap at a density of .95 G/cc or less. Similar compositions, that are unfoamed, will not be cap or even booster sensitive, unless strong confinement and very large boosters are used.

Melt apparatus set-up.

CAST AN-FUEL (high density "AMMONEX")

DETONATION VELOCITY - (well confined) 3900-6600 M/sec.
DETONATION PRESSURE - 1,200,000-3,500,000 P.S.I.
SENSITIVITY - Very insensitive. Requiring heavy boosters with very strong confinement.

USE-

BLASTING - Would be a good blasting explosive, but other formulations in this book would be a better choice due to their easier method of manufacture and lack of high confinement requirement.

DEMOLITION - The last two formulas will be comparable to T.N.T. in shaped charge application, but require very large boosters. The last two charge compositions would be the only explosive "Ammonexes" suitable, as the other two have much too low of a detonation rate.

MUNITION - Superb munitions loading explosive. These ammonex type explosives were developed in WWII as a replacement for T.N.T.. The U.S. had an adequate supply of T.N.T. and these explosives never came into use. The last two formulas given are the best and should have storage stability similar to military T.N.T. The first two will tend to extrude from the loaded munitions at elevated temperatures (60-70 degrees C. for seven days). They also possess lower detonation velocities, but are easier to manufacture than are the last two. These ammonex explosives would all find excellent application as cast iron body (e.g. "pineapple") grenade fillers, but would require four to eight gram boosters of picric acid, R.D.X., tetryl or other similar explosives.

The ammonex explosives were developed at the famous PICTINNY ARSENAL in Dover, New Jersey during the second world war. The adequate supply of T.N.T. in the U.S. made this development one of obsolescence. The ammonex cast explosives are really below T.N.T. performance, unless they contain CHNO explosive additives, they are useful none the less due to their simple ingredients and manufacture. The curse of cast AN explosives up to this development was the very high melt temperature (169 degrees C.) required to bring them to "pour point". This tended to cause premature detonation and subsequent short plant life!!! The ammonexes make use of a simple idea. That addition of a combustable that will lower the melting temperature of the AN and form an eutectic mixture of AN and fuel. The addition of urea gave the explosives the low melt temperatures, but tended to be unstable in storage (extrudation). The addition of calcium nitrate (anhydrous), gave its mixture with AN a low melting point, allowing the manufacturer to add a higher detonation velocity explosive (Tetryl or ammonium picrate). This gives an explosive with performance comparable to T.N.T.. The molten explosive is cast into the munition intended. The first two explosive formulas (# 1, #2) should give fragmentation performance compared to T.N.T. 24% and 41% respectively. The last two formulas (#3, #4) should give comparative performance to T.N.T. of 85% and 100% respectively. The munitions to be loaded should be coated inside with high temperature paint (epoxy base) or asphalt. And of course, the use of AN with any copper or copper containing alloy (brass etc.) should be avoided.

The melting is simple. The ingredients are heated in a stainless steel pan with a candy thermometer in place. The heating should be done slowly and evenly. The explosive should melt between 90-100 degrees C.. The molten explosive is stirred and then poured into the munition.
CAUTION: The molten explosive is very hot and would cause severe burns if handled carelessly. Protect any part of your body, unless you do not mind getting burned.

As this molten explosive cools it will solidify. The munitions should be protected from extremes of temperature. With the first two compositions this rule is crucial. The ingredients of the four different compositions are as follows:

AMMONIUM NITRATE (Fert, grade)	78.0%
UREA (Powdered)	11.0%
ALUMINUM POWDER (400 mesh)	11.0%

#2

AMMONIUM NITRATE (Fert, grade)	78.0%
UREA (Powdered)	11.0%
CALCIUM SILICIDE (Powdered)	11.0%

#3

AMMONIUM NITRATE (Fert, grade)	36.0%
SODIUM NITRATE	5.5%
CALCIUM NITRATE (Anhydrous)	8.0%
DYCYANDIAMIDE	5.5%
TETRYL	45.0%

#4

AMMONIUM NITRATE (Fert, grade)	36.0%
SODIUM NITRATE	5.5%
CALCIUM NITRATE (Anhydrous)	8.0%
DYCYANDIAMIDE	5.5%
AMMONIUM PICRATE	45.0%

The tetryl additive in formula #3 is difficult to manufacture and unless the manufacturer is very familiar with chemistry and lab procedure, its manufacture is dangerous. This particular formula is given anyhow. The ammonium picrate of formula four is simple to make. Picric acid is made or obtained (Kitchen Improvised Plastic Explosives has a manufacture procedure for picric acid that is very easy. Chapter 7). Ammonia water (plain) is placed in a glass jar. The picric acid crystals are dropped into the ammonia water. This addition is completed. The P.H. is checked with P.H. paper. It should be 7.0 or above. The ammonium picrate crystals will form in the solution and should be filtered out and dried. The other chemicals are very common. They would be very easy to obtain surreptitiously.

AN-METHYLAMINE NITRATE
(Cast explosive) - "FORMIT"

DETONATION VELOCITY - 5400 M/sec.
DETONATION PRESSURE - Slightly less than T.N.T.
SENSITIVITY - Requires a booster for complete detonation.

USE-

BLASTING - A good choice, but cost effectiveness goes to ANFO. The need for a booster limits blasting application. High gas yield upon detonation with good shattering properties.

DEMOLITION - Could be used in the demolition field in some applications that a cast explosive would find use. Perhaps could be used for mudcap type blasting practices. Detonation velocity is the one of the two limiting factors for this explosive.

MUNITIONS - Originally developed as a substitute explosive by the Germans in WWII. The undesireable trait of this explosive, from a munitions use standpoint, is the fact that, at slightly elevated temperatures (60-70 degrees C.) this explosive extrudes from the device or shell it has been loaded in. Caution should be taken to make sure that no copper or alloy of copper should come in contact with the explosive composition.

Originally developed by Dr. Hans Walter as one of the substitute explosives and designated "Formit". It is a faintly yellow explosive formulation. Developed in the late part of WWII, as the Axis powers chemical industries were being bombed to dust. The actual composition of this explosive is Methylamine Nitrate ("MAN") 25-30%, Ammonium nitrate 67-74% and trimetnylammonium nitrate 1-3%. MAN is the major sensitizer in E.I. DuPont's "Tovex" series explosives. This is the only dynamite DuPont makes now. This is a cast explosive with a setting point of 90 degrees C. The only drawbacks of this explosive are the tendancies to extrude from the loaded munitions and the lower detonation velocity as opposed to T.N.T.. This would be a simple explosive to make. The 37% formaldehyde solution is added to the ammonium nitrate. *CAUTION: Avoid Breathing Formaldehyde! Use with GOOD ventilation!*

The resulting solution is heated to boiling in a pyrex or stainless steel pan with a lid for 1 hour ("Reflux"). This liquid is then placed in a "filtering"flask hooked to a vacuum source. A vacuum pump will work and so will a vacuum aspirator, but the latter will do so at a much cheaper cost. The vacuum will cause the solution to boil at a much lower temperature. The flask should be placed in an electric frying pan that has been filled with cooking oil. The oil should be kept at 90 degrees C.. The solution will boil away. End point of this is at 470 ml. liquid remaining in the flask at a temperature of 90-100 degrees. A vacuum gage in line will give a drastic change when the end point is reached as the vacuum is increased. The water will have completely boiled out of the solution. This liquid remaining in the flask is poured directly into the mold and allowed to cool, as the remaining liquid in the flask is the melted explosive munition desired. When casting explosive, care should be taken to leave a "well" or hole for the booster and/or detonator.

37% Formaldehyde solution .... 450 ml.
AN Prills .... 480 G.

The 37% formaldehyde can have paraformaldehyde substituted for it as in the following:

Paraformaldehyde .... 180 G.
AN Prills .... 480 G.
Water .... 90 ml.

The AN is mixed with the water first and heated to effect solution. With solution the Paraformaldehyde is added and the solution heated as in the first composition and boiled for one hour as above and vacuum dehydrated as above.

The addition of 15% total explosive weight of R.D.X. or P.E.T.N. (from det. cord) will give this explosive the same amount of power as T.N.T., but the bristance or fragmentation effectiveness will be greater than T.N.T.. I also believe that the addition of 20% bullseye smokeless powder will do nearly the same thing. The undehydrated liquid could also be used as a sensitizer for slurries.

AN-HYDRAZINE (Hydrazine nitrate)

DETONATION VELOCITY - 8500 M/sec.
DETONATION PRESSURE - 5,000,000 P.S.I.
SENSITIVITY - One #6 blasting cap will detonate.

USE-

BLASTING - Too expensive to be used.

DEMOLITION - Equivalent to C-4 in detonation velocity and bristance. The only drawback of this explosive is its liquid form. This can be overcome with a little planning.

This explosive is more powerful than C-4 plastique explosive. With its high detonation rate and great bristance, it should find some use. It is more sensitive than most explosives obtained from AN, since it is not AN but hydrazine nitrate. This explosive liquid is very corrosive and this should be taken into affect when suitable containers are rounded up in which to place the explosive. Hydrazine is a hard chemical to find. Used as a rocket fuel, obtaining this chemical could arouse suspicion. It is used as a boiler deoxygenator and perhaps could be procured for this purpose. The manufacture is simple with the AN prills being dissolved in the hydrazine by small additions with good ventilation, as ammonia gas is produced by the reaction.

To manufacture this hydrazine compound, the hydrazine is placed in a container that would hold five times the amount of hydrazine being used.
CAUTION: Hydrazine is a dangerous chemical and ALL and any contact what so ever should be avoided.

The ammonium nitrate prills are added a little at a time in an area with good ventilation, to avoid the ammonia gas produced. When the small additions of AN are made, the solution will boil up in the glass container. This reaction should be allowed to subside before the next addition. These additions should be made until they no longer cause the effervescent reaction. More AN is added while stirring until no more will dissolve in the solution. The liquid remaining is a liquid explosive more powerful than any military explosive with the exception of perhaps straight "MEDINA". This liquid can be used to boost a powdered ammonium nitrate charge by powdering the AN and pouring the clear liquid over the powder. The following percentage of this composition should give explosives with a detonation velocity of 6800 M / sec., whereas the straight liquid is much more powerful, this will effectively stretch the hydrazine nitrates power:

HYDRAZINE NITRATE LIQUID	25%
AMMONIUM NITRATE (Powdered Fert.)	75%

Care should be taken so that this composition does not contact other things or metals, except inert materials to ensure the explosive is not contaminated, as this could result in a premature detonation.